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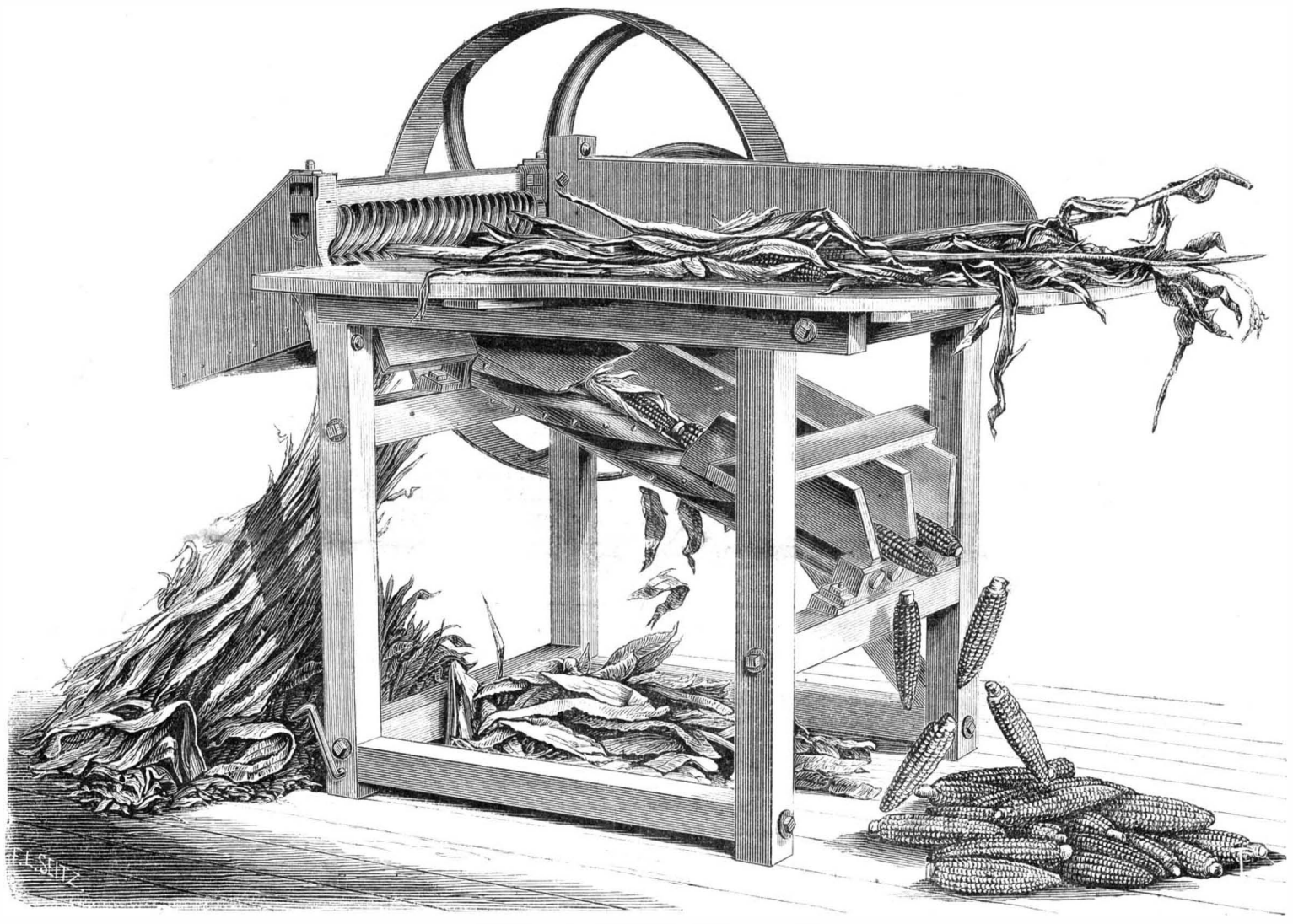
Improved Corn-husking Machine.

The immense extent and value of the Indian corn crop of the United States gives importance to any improvement calculated to lessen the labor of its production. One of the heaviest items in the labor account is the husking—a slow and tedious process when performed by hand. Inventors have not been slow to see the great prospective value of a machine which would cheaply and rapidly husk corn, and many attempts to produce such a machine have been made. We are sorry to say that the difficulties to be surmounted, have been found so great that, for the most part, the corn-husking machines hitherto invented have proved failures. The one which forms the subject of the present article has, it is claimed, shown itself perfectly successful in practical use. If this claim be established certainly, there could be nothing of greater importance and interest, to the country at large, placed before our readers.



PHILLIP'S SPIRAL CORN HUSKER.

The machine consists of a frame about three feet long and two and one half feet in width, made of three-inch joists. Across one end and near the top of the frame are placed two picking rolls, formed with screw threads on each roll, and gearing into each other.

The stalks are fed between these rolls and fall in front of the machine, in good condition for binding, and divested of every ear, great or small.

The ears, as they are separated from the stalk, fall upon the husking rolls placed lower down on the frame, at right angles to the picking rolls and in an inclined position.

Upon the surface, of one or both the husking rolls, are spiral depressions or grooves which answer the double purpose of allowing spikes to be put upon the opposite roll corresponding with the depressions or grooves, and allowing the ear to settle down between the rolls, so that the grip upon the husk may be more certain. These depressions and spikes being placed spirally upon the rolls grip the husks first at the end of the ear, and continue the grip to the opposite end, making the process of stripping the husk from the ear very similar to that of hand husking.

It is claimed that the machine does its work thoroughly, stripping the husks and silk from every ear and nubbin, whether it be large or small, hard or soft. The stalks are delivered in a crushed state and in a much better condition for fodder than when left solid, and they also rot quicker in the manure heap. It is further claimed that the husks are delivered in so good condition as to be worth from $59 to $70 per tun for industrial purposes.

An ordinary two-horse power used for thrashing will drive the machine, and the manufacturers are preparing to build hand machines, by which they claim that two men will be able to husk 400 bushels per day.

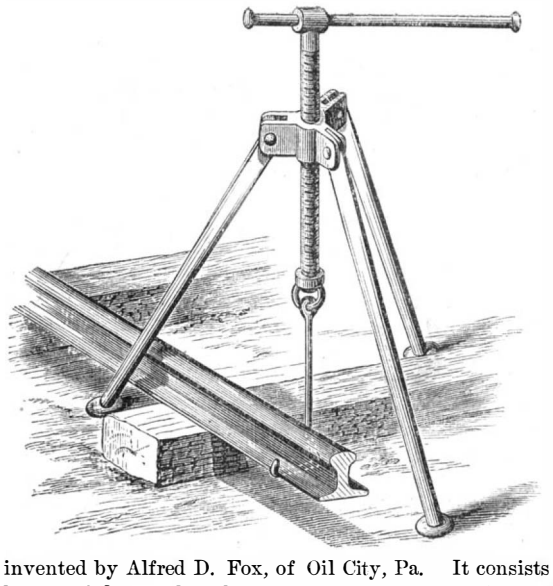
We are told the machine was extensively introduced last fall, and gave good satisfaction to those who used it.

For further information address F. F. Folger, Hudson, N. Y., or W. H. Hoag, 214 Pearl street, New York city.

DURING the winter of 1868-9, some piles, driven into the bed of the Connecticut river, for the purpose of building the bridge, across that stream, for the Shore Line Railroad, were broken off by ice, and, being dangerous to navigation, many attempts were made to remove them, but without success. Finally, a four inch iron pipe, shod with a steel point, was driven down besides them by means of a sliding ring, arrested by a shoulder on the tube. A charge of gunpowder (four pounds) was put down the tube and fired. The piles were fairly shaken out of the earth by the explosion.

RAILROAD JACK.

The annexed engraving illustrates a lifting jack for rails,



invented by Alfred D. Fox, of Oil City, Pa. It consists of a hooked link, attached, by a swivel, to a screw working a nut, to which the legs are pivoted, as shown. The legs, working independently, render it easy to adjust the nut directly over the rail, and a few turns of the screw will then raise the rail from the sleeper.

The Use of Silver in Decorative Art.

In silver we have a material which, apart from its intrinsic value, possesses many qualities valuable to the artist. It is far more ductile than bronze, and at the same time has natural hardness sufficient to resist any ordinary risks of wear. This hardness may be increased by alloy. In addition, it is exceedingly durable, and admits of the highest finish. It is also open to two distinct methods of treatment, which may be used separately or in combination. If polished or burnished, its whiteness and strong high lights preclude delicate work in the detail; at the same time, these qualities result in inconceivable splendor of effect when boldly treated, especially in objects which are made to depend upon form in such a way as to exhibit the burnished surface to advantage. Bold bossed work is very effective, and may be used with excellent results either alone or in combination with engraving or répoussé relief. A matted ground is then valuable to the latter. Engraving, to tell well on bright silver, must be pretty boldly executed, the lights being otherwise lost in the overlapping reflected rays of light shed from the surrounding surface. For art purposes, the most favorable form of silver is that known as "oxidised," in which the extreme whiteness and brilliancy of surface are subdued. It then possesses the finer qualifications of bronze in a higher degree, and the light gray color which it presents, together with the fine surface and softened lights, render it the best of all materials for delicate and highly-finished relief. In fact, the chasing may be as fine as the artist can bestow, nor need we fear that his labors will be lost. Many valuable modern works have been executed in this country, though by foreign artists, and some excellent reproductions have been made in *facsimile* by the electrotype process. The most beautiful modern specimens of *répoussé* silver, however, which I remember, were exhibited in 1867, by Faunière, of Paris, who, in a table service (said to have been designed by an amateur for his own use) combined excellence of form and design with most admirable treatment in execution. It is satisfactory to find that one of the English artisans whose reports were published by the Society of Arts appreciated the remarkable excellence of the works from this *atélier*. "Other exhibitors," he says, "show some good pieces," but in Faunière's case "I think it is impossible to discover one

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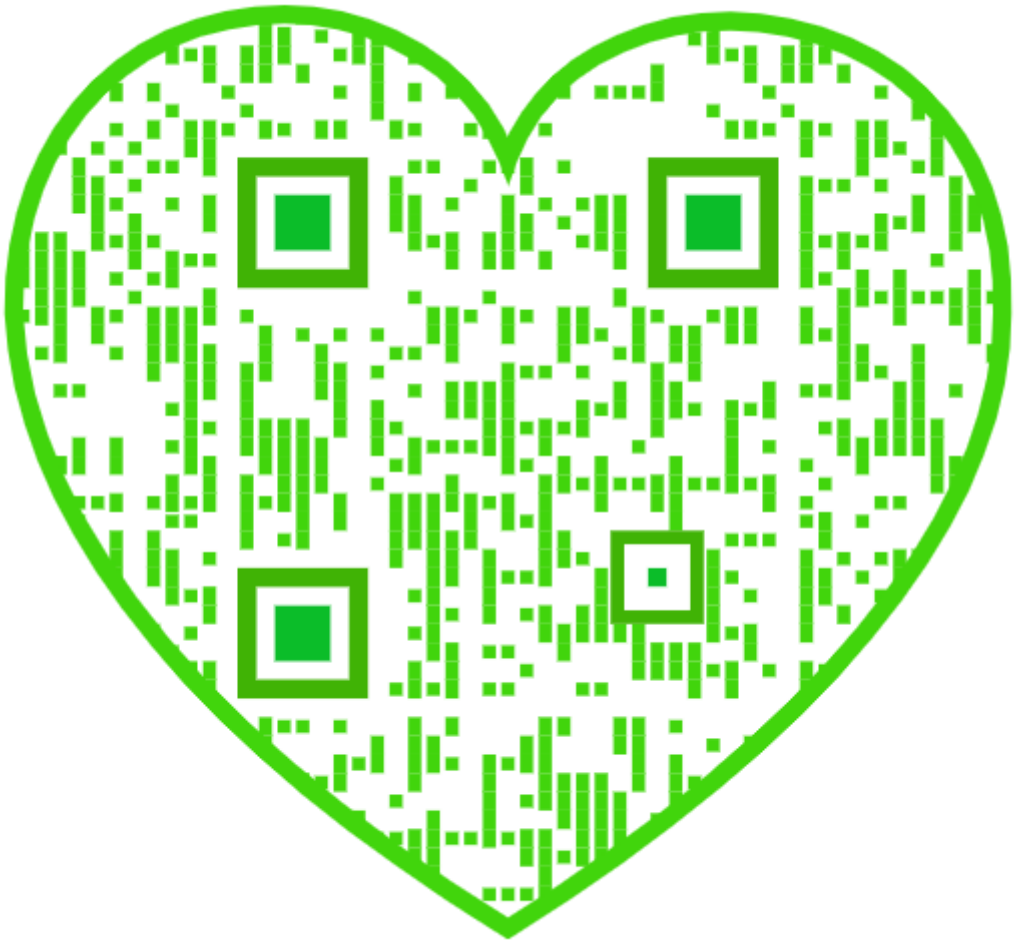

piece of inferior work, while many are real master-pieces." "Party-gilding" and "damascening" may both be used on dull silver with good effect, the main point to care for being to avoid confusion. Engraving may be used with both, and if the surface be not polished, may be as fine or as elaborate as may be desired. A hatched or matted ground, judiciously used, often adds greatly to the effect of low relief, or may sometimes be used to show a flat ornament with engraved outline.—*J. D. Crace.*

ADULTERATION OF ARTICLES IN GENERAL USE.

It is certainly within the memory of most of us, says the *American Exchange and Review*, when plain white cotton goods consisted alone of the fiber of the plant which gives them their name. When we bought such in those times, they were not as now, perhaps, "dressed" to the extent of more than a quarter of their weight with foreign matters, among which fine white clay holds so prominent a place. Our wall papers were then considered heavy enough, and our writing and printing papers had sufficient body without such noticeable dressings of kaolin, and the products of the workings of clay deposits were turned into their legitimate application for the production of porcelain and white stone ware. Preferring to grind our own coffee, the cup was drunk without the after-thought that chicory and dandelion root and rye were essential elements in its composition. If sand were found in the sugar, it was regarded as an adventitious matter, and we did not then hear of it and of torrified starch as prominent ingredients.

Frequency of handling and necessity of preparatory manipulations would appear now to be universally accompanied by sophistication. Additional price for labor performed and material consumed affords insufficient margin for profit, and lower priced substances: with allied physical, if not chemical properties, and generally with distinct applications and uses: are deemed necessary to increase of profit. Thus, while the rags from which paper is made are comparatively expensive, the carefully prepared and almost perfectly white clay sells to the paper manufacturer for not more than one and a half cents by the pound, and is worth, in money at least, greatly more than this in stock. The old Dutch method of white lead manufacture, while it produces by far the best of paints, is expensive, in so far as time is concerned, and barytes, worth possibly two cents a pound, will wonderfully increase profit, if it does not improve the quality of the paint; but this last is the consumer's concern. The white lead leaves the manufactury possibly in a pure state, but frequent manipulations are necessary before it is a paint, and the opportunities for adulteration are too numerous and too propitious for it to escape falsification. Hence, the pigment reaches us laden with foreign matters, not only in the basis itself, but in the oil, turpentine, and other materials which are required for its preparation.

The substance called barytes is one of the most common of falsifiers. It is an abundant mineral, which, after grinding and elutriation, requires nothing but treatment with weak or diluted acids to render it a perfectly white powder of great density and of considerable body. But notwithstanding these advantages, it is not a paint in the strict acceptation of the word, though its extensive employment might lead to such supposition. We find it entering into the composition of other commercial articles. Much of the cochineal used in the arts is simply this sulphate of baryta rolled in the moistened dye stuff till it constitutes half of the weight of the fictitious coloring matter.

There is an allied substance, gypsum, which is even more abundantly distributed than the barytes, and this has become, on account of its lower price, of much importance in adulteration. It has been found in starch to the extent of nearly one fifth of the weight of the amylaceous compound. The amount of it that may be added to artificial fertilizers, without detection by ordinary means, is only limited by the conscience of the manufacturer, and this limit can hardly be regarded as a safe one in the face of what chemical analysis points out. A purple dye material, called litmus, should be, according to Webster's Dictionary, "obtained from a lichen, the archil, and from an euphorbious plant, common in the south of Europe," but is, commercially, small cubes of gypsum, stained or impregnated with the coloring matter of these plants. Indigo itself does not escape sophistication by the same substance.

Dye stuffs seem to be favorites upon which to exercise skill in adulteration. In commercial madder, we find any or all of sawdust, almond husks, bran, pine bark, acacia wood, spent madder, sand, clay, brick dust, and ocher. Cochineal should be the dried carcasses of the *coccus cacti*, but usually consists of the same intermixed with white lead, barytes, soapstone, fragments of metallic lead, and with the spent dye. Prussian blue contains artificial ultramarine (now prepared at a cost of not more than fifteen cents per pound); chrome yellow holds fully seventy-five per cent of its weight of barytes; anotta has red ocher, powdered bricks, colcothar, chalk, gypsum, turmeric, and farinaceous substances, whilst the turmeric itself is extensively falsified.

But these are matters which affect us but little when compared to articles of food and diet. These, it might be thought, would escape falsification, since consequences much more serious and alarming might be the result of their adulteration. But we find very few articles of food, requiring previous artificial preparation, to be without sophistication. Alum, sulphate of copper, and sulphate of lime, have been found in bread, in addition to the possibilities of falsification in the original flour. Milk has been suspected to contain an undue amount of water, and has been found at times with dextrine, starch, sheeps' and calves' brains, chalk, and magnesia entering into its composition. Butter may contain water, flour, and earthy substances. Tea is adulterated with Prussian blue, indigo, gypsum, chromate of lead, and copper compounds, and is sometimes made up entirely of tea dust, ground rice, and gum. Coffee is not always the dried berries of the *Coffea Arabica*, whatever the popular belief may be, but is frequently made up of chicory, roasted corn, acorns, and leguminous seeds. Chocolate was formerly regarded as a preparation of the *Theobroma cacao*, but that was in the days of Linnæus, who justly regarded its infusion as "the nectar of the gods;" now it is largely composed of starch and amylaceous substances, iron ocher, and other mineral matters. Cayenne pepper has been known to contain red lead, and is frequently found with colored sawdust as a component. Mustard is falsified by the addition of wheat flour colored with turmeric, and the mixture is rendered sufficiently hot by the addition of red pepper. Salt, it may safely be asserted, escapes adulteration, but not so with vinegar, which, as is well known, not unfrequently contains oil of vitriol, and then of a verity there is death hidden in the cruet. Olive oil is made from lard, or else is adulterated with poppy oil, and the rancid substance is sometimes treated with litharge, for the purpose of making it sweet, leaving variable amounts of lead compounds in the article for table use. An investigation of the various pickles and proprietary sauces would hardly be conducive to the peace of mind of one devoted to their use, whilst the sweetmeats and candies, which tradition tells us were once composed mainly of sugar, are composed essentially of starch, flour, and paraffine, to say nothing of the arsenical and other mineral pigments with which they are adorned. Happily, however, this last cause of injury is being removed by the substitution of the inoffensive aniline, or coal tar colors, for purposes of ornamentation.

Thus much for the articles that grace our tables. It fares perhaps a little better with the remedial agents we are wont to employ, though many of these are alarmingly adulterated. Patent or proprietary medicines possibly escape this stigma, but as they frequently are potent enough for evil in themselves, we can hardly congratulate ourselves upon finding in them a safe refuge in disease.

In many instances, the dyes and pigments used about our wearing apparel, and in the figures on our wall papers, are open to serious objections. Arsenical and lead colors are of too frequent employment for such purposes, and suffering and death are traceable to their use. The writer found, in one case brought to his notice, as much as twenty-three grains of white arsenic in a square foot of green figured wall paper, whilst the medical and technical journals have recorded frequent instances of injury directly traceable to tarlatan and other dresses dyed with Schweinfurth or Scheele's green. It would be an interesting question, if solution were practicable, how far paralysis and some other forms of disease were traceable to the lead glaze in paper collars, and possibly some of the onus now resting on the contamination of water by leaden pipe might be removed by such an inquiry and investigation.

The Aurora Borealis.

What is the origin of this remarkable phenomenon?

Terrestrial magnetism is the unknown influence, seen by its effects upon the artificial magnet, causing the inclination and declination of a magnetised bar of steel. We have no recorded observations of magnetic phenomena before 1828, but they have been general since. Instruments called magnetometers are used for these observations. The decennial variation of the magnetic elements is very important. Thus, for example, the frequency of magnetic storms, which cause the magnets to oscillate to and fro, often with great rapidity, in different years, gradually increased from a minimum in 1843 to a maximum in 1848, giving a variation of about eleven years altogether. It has been found that the solar spots are also periodical. M. Schwabe, of Dessau, observed these for twenty-four years, and found they had a regular maximum and minimum every five years, and that the years 1843 and 1848 were minimum and maximum years—thus exactly coinciding with the magnetic decennial variation. Mrs. Somerville says the discovery of the magnetism of the atmosphere placed the aurora in the class of electro-magnetic phenomena. It may be described as a "luminous discharge of superabundant magnetism," occurring in the north and south where the air is highly magnetic, and denoting the conclusion of a magnetic storm. Not only do the solar and magnetic disturbances coincide at regular intervals, as before observed, but the auroral displays coincide also with them. For example, in 1859, great solar disturbances were observed, the Greenwich magnets were displaced, and a fine aurora was visible. Eleven years bring us to the present time, 1870; and in the *English Mechanic*, October 21, Mr. R. A. Proctor gave an illustrated description of the sun's spots as they existed September 25, on which day he says "no less than one hundred and two distinct *umbræ* were counted." Mr. Allnatt points out that, on the night of the 24th September and morning of 25th, an aurora of unwonted magnificence was visible at various outlying stations in England and Germany. Respecting the displacement of magnets, we shall presently have occasion to refer to the effects produced on the telegraphic needles.

The Rev. J. Farquharson says "that the aurora follows a determinate order in its appearance and progress; that the streamers or beams generally appear first in the north, forming an arch from east to west, having its vertex at the line of the magnetic meridian; that when this arch is yet only of low elevation, it is of considerable breath from north to south, having the streamers of which it is composed placed crossways in relation to its own line, and all directed towards a point a little south of the zenith; that the arch *moves forward towards the south*, contracting its lateral dimensions as it approaches the zenith, and increasing in intensity of light by the shortening of the streamers near the magnetic meridian, and by the gradual shifting of the angles which the streamers near the east and west extremities of the arch make with its own line, till at length these streamers become parallel to that line, and then the arch is seen as a narrow belt three degrees or four degrees only in breadth, extending across the zenith at right angles to the magnetic meridian."

There is great difficulty in determining the hight of the displays of the aurora. Mrs. Somerville says either it must occasionally be high above the earth, or its coruscations must be very extensive, as the same display is generally visible at places wide asunder. An auroral bow which appeared in the United States, June 11, 1852, had such a decided parallax that its lower edge was computed to be one hundred and forty miles above the earth, and its upper edge two hundred and eighty. The above named lady says that though it has frequently been seen in North America, and all over the north of Europe at the same time, Sir E. Parry saw a ray dart from it to the ground near him. Admiral Wrangle assigns a very moderate elevation to it. Dr. Halley says Father Boscovich determined the hight of an aurora, observed December 16, 1737, to have been eight hundred and twenty-five miles. Bergmann makes the average hight of thirty observations of aurora to be four hundred and sixty English miles. Mr. Dalton, in a paper read before the Royal Society, April 17, 1828, describes a display he witnessed on March 29, 1826, assuming the form of a regular arch at right angles to the magnetic meridian. This was seen in places one hundred and seventy miles distant from one another in a north and south direction, and forty-five miles distant from east to west, or an area of seven thousand or eight thousand square miles. He found the hight of the arch about one hundred miles above the surface of the earth over the town of Kendal, and the breath of the arch eight or nine miles. Upon these observations, Mr. Farquharson thinks there were several nearly vertical arches of the aurora almost contemporaneously hanging over many lines from Edinburgh to Warrington at a few thousand feet above the surface (*Philosophical Transactions*, i. 1829). A writer in the *Encyclopædia Britannica* states that Dr. Richardson's observations seem to show that the aurora is occasionally seated in a region of the atmosphere, below a kind of cloud which is known to possess no great altitude. He thinks the aurora is constantly accompanied by the formation of one or other of the forms of cirro-stratus. The natives of the arctic regions of North America pretend to foretell wind by the rapidity of the motions of the aurora, and they say that, when it spreads over the sky in a uniform sheet of light, it is followed by fine weather. Captain Franklin says: "The important fact of the existence of the aurora at a less elevation than that of dense clouds, was evinced on two or three occasions this night (February 13, 1821, at Fort Enterprise), and particularly at 11.50, when a brilliant mass of light, variegated with the prismatic colors, passed between a uniform steady dense cloud and the earth, and in its progress completely concealed that portion of the cloud which the stream of light covered, until the coruscation had passed over it, when the cloud appeared as before." These statements are sufficient to show that the altitude of the aurora differs very considerably.

Observers have also differed on the question as to whether any sound accompanies the phenomenon. Parry and Richardson say not. Franklin observes: "I have not heard the noise ascribed to the aurora, but the uniform testimony of the natives and residents in this country induces me to believe that it is occasionally audible." Lieutenant Hood says: "We repeatedly heard a hissing noise, like that of a musket-bullet passing through the air; but Mr. Wentzel assured us that this noise was occasioned by severe cold succeeding mild weather, and acting upon the surface of the snow, previously melted in the sun's rays." Mr. Nairne is sure that he has heard a hissing noise when the polar lights were very bright. Giesecké says: "The polar lights appear sometimes very low, and then they are much agitated, and a crashing and crackling sound is heard, like that of an electric spark, or the falling of hail." Mr. Ramm, of Tonset, in Norway, says: "If this light occupy the whole northern sky, rising more than seventeen degrees above the zenith, the rays must proceed from under the feet of the observer, although they do not receive their reflecting power till they have reached a considerable elevation, perhaps beyond our atmosphere. It is therefore conceivable why we should frequently hear a noise attending the northern lights, when the inhabitants of southern countries, who see the phenomenon at a distance of many hundred miles, hear no report whatever." Professor Hansteen expresses his surprise that a fact so well established should be called in question. The writer of the article on the subject in the *Encyclopædia Britannica* says he has heard these noises both in this country and in the Shetland Islands.

Mr. Culley, the Engineer of Telegraphs to the Postmaster-general, in the *Times*, October 31, 1870, says the aurora is a kind of lightning, differing from ordinary lightning in being a gentle and gradual flow, instead of a violent and sudden discharge. The so-called electrical "earth currents" were especially powerful during the late displays, and different in strength and direction, so that it was often impossible to read a message.

The telegraph wires running east and west suffer most. When there are several wires available between two stations, the earth connections are cut, and the wires are looped, so as to use one of each pair as a return wire, in place of the earth thus forming a complete metallic circuit." This plan, however, enables only half of the instruments to be used. It had been remarked that the auroræ have only recently affected

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the instruments, because insulation is not now so well attended to as some years since. Mr. Culley says this is a mistake, the effect of the earth-current being in many cases the greatest in the best insulated lines. The Atlantic cables, for example, whose insulation is absolutely perfect, have been more disturbed than any land line.

Ancedote of Thomas Brassey, the Great English Railroad Contractor.

The patient sagacity and calm resolution to abide by the rules he had laid down for his own conduct, which enabled Mr. Brassey to perform, at the same time, an amount of work equal to that of three or four Ministers of Public Works put together, may be illustrated by an anecdote never until now put forth.

In the year 1862 Mr. Brassey was in Turin. Some Italian notables of that day called upon him at the Hotel Trombetta, in order to obtain his support for one of the great enterprises by which it was then sought to enrich the Peninsula. Mr. Brassey was conversing with an English engineer (who had himself been served by an Italian Government much as a captive kite is served by the game-keeper, who suspends him as a terror to other predatory birds), when the deputation arrived,—a lawyer of eminence, a member of the administration, more than one deputy of the Chamber. Ensconcing his companion in the inmost chamber of the suite, where every word that passed was distinctly heard, and where he was asked to wait for half an hour, Mr. Brassey received his visitors. Nothing could be more apparently satisfactory than the commencement of the interview. The advantage of the project was set forth by the projectors, and admitted by Mr. Brassey, whose brief occasional remarks showed that he had thoroughly mastered the subject. When the whole matter had been presented in its fairest light, by one and another of its advocates, Mr. Brassey remarked that it might save time if he explained the invariable principles on which he conducted business. He was willing to afford a large measure of support to any enterprise of which he undertook the works. He was prepared, in such case, to subscribe to the capital, and to hold, without forcing on the market, a certain proportion of shares, or bonds, or both. But such financial arrangements must be entirely distinct from those made for the execution of the works. For that he must receive monthly payment in cash, according to regular monthly certificates by the engineer, of from 80 to 90 per cent. of the value of work done. If the directors were prepared to deal on these terms, he should be ready to enter at once into the details of prices.

The deputation were delighted. Nothing could be more to the point, or more in accordance with their ideas of business and habits of action. Then they commenced a review of the features of the scheme, and travelled, a second time, over the ground already covered, rising, however, in enthusiasm as they dwelt on the unrivalled advantages which the shareholders would enjoy. They considered the contract as settled with Mr. Brassey. The terms were fully acceptable to both sides, and they would send their engineer to meet Mr. Brassey's engineer, and settle the details of the schedule, as to which no difficulty could arise, as there were ample precedents to follow. They would take their leave of their honored friend with the utmost content. The little noise which accompanied the rising of half a dozen persons succeeded. The door opened, and, just in backing out, "Of course," said the first speaker, "Mr. Brassey had no objection to accept, as cash, the shares of the Company for which he had promised to subscribe!"

"Stop, gentlemen," said Mr. Brassey. "I am sorry that I have failed to explain my meaning. You must not go away under a mistake. I told you, that, if we agreed to the details, I would subscribe for a certain proportion of shares. But I told you that this must be kept quite distinct from the monthly payments. They must be regularly made in cash, to my bankers; on no other consideration will I look at the business. I have large sums to pay every month, and I cannot allow any uncertainty to subsist as to the regularity of my receipts. Pray understand that. It is a *sine quâ non*."

"Of course, if Mr. Brassey put it in that way, the directors would be delighted to meet his views. They had merely intended to avoid trouble, by proposing one transaction instead of two. But it was for Mr. Brassey to decide." Then followed a second repetition of the entire argument, to which Mr. Brassey listened with great patience. Again the leave taking process was gone through; and, again, as if a mere casual remark —"The directors understood that the company's obligations were equivalent to cash, as, in point of fact, they were at 3 per cent. premium, and therefore worth more than bank notes."

"In that case," Mr. Brassey rejoined, "it would be easy for the company to convert them, and to pay him in money. He did not wish for more than his price. The advantage to be be derived from the premium on the obligations might be very large. So much the better for the company, but he had explained his own invariable system."

It would be intolerably tedious to attempt a more detailed account of the entire conversation. In a word, the half hour for which Mr. Brassey had imprisoned his countryman, lasted from to six till nearly ten p. m., when the deputation at length retired, making arrangements for a second interview. The Italians were thoroughly beaten and tired out with their own efforts. They had not made an inch of way. The regular payment, insisted on by the Englishman, they had never dreamed of really making. They brought their fullest experience of legal and Parliamentary tactics to bear on the unaided common sense of the great contractor, whom they endeavored to use; and they came to grief against his clearsighted honesty. He never undertook their contract.—*The Builder.*

Dr. Sheridan Muspratt.

We regret to record the death of this eminent chemist, which occurred on February 4th, at Liverpool. Dr. Muspratt's name has been so long and so prominently associated with the progress of chemistry, that it is with some surprise that we learn that his age was only fifty. The following sketch of his career appears in "Men of the Time:"

James Sheridan Muspratt, M. D., F. R. S. E., M. R. I. A., etc., chemist, born in Dublin, March 8, 1821, was, on account of his father's removal to Liverpool, educated by the Rev. Mr. Hind, and afterwards by Dr. Cowan. At this early period he evinced a taste for chemistry; and, having travelled through France and part of Germany, he entered the Andersonian University of Glasgow, where he studied in the laboratory of Professor Graham, whom he followed to London. Before he was seventeen, he was intrusted with the chemical department at the works of Peel Thompson, in Manchester, and published a paper upon "Chloride of Lime," which attracted considerable attention. Proceeding to the United States, he entered into a trading partnership, which proved unsuccessful; and after visiting the various States, he, in 1843, repaired to Giessen, and studied under the great Liebig. Having remained two years in Giessen, he resolved to test his strength, and published a paper upon the sulphites, which appeared in Liebig and Wöhler's *Annalen*, was copied into all the scientific annals, and won him his degree of Doctor of Philosophy, a title never before granted to a man so young. It was followed by a paper on the "Pretended Formation of Valerianic Acid from Indigo," read before the British Association at York.

At this period, in conjunction with Professor Hofmann, he discovered toluidine and nitraniline, two organic bases of the utmost importance; in 1845 he left Giessen, having, while there, edited Plattner's "Treatise on the Blowpipe," which reached a fourth edition, with emendations, bearing the title "Muspratt and Plattner on the Blowpipe." Dr. Muspratt, who visited various parts of Germany in order to become personally acquainted with her distinguished men, in 1847 returned to Giessen, and spent four months in its laboratory, discovering several remarkable bodies produced from the sulphocyanides of ethyle and methyle. A paper on this subject was printed in Liebig's *Annalen*, as well as in the "Chemical Society's Transactions." In 1848, he gave a paper on the Selenites; in 1849 he published some very interesting remarks in Liebig's *Annalen*, on "The Blowpipe Reactions of Strontia and Baryta." His paper on "Carmufellic Acid, a new Acid from Clove," was published in 1851, in the "Proceedings of the Royal Society," and in the *Philosophical Magazine*. He founded a college of chemistry in Liverpool, students from which occupy prominent posts in in various parts of the globe.

In 1854, a Glasgow publisher engaged Dr. Muspratt to write a Dictionary of Chemistry, which has commanded a large sale in England, America, Germany, and France. He was elected a Fellow of the Royal Societies of Edinburgh and Dublin, and a member of the Société d'Encouragement in France; and the oldest university in the United States conferred upon him the honorary degree of M. D., the only one held by a British subject. In 1863, he published a reply to a critique in *Blackwood*, condemnatory of the "Dramatic Writings of Sheridan Knowles," his godfather; and in 1848 married Miss Susan Cushman, a popular actress (sister of the celebrated actress, Miss Charlotte Saunders Cushman), who died in 1859.

Wanted, the following Inventions.

A TRUE VELOCIPEDE, consisting of one or more wheels, of suitable diameters, with vulcanized rubber tires, attached by a frame-work to each foot, the whole being a modification and improvement of the parlor skate, the rubber tires adapt it to the inequalities of the ground. If a locomotive can, by this means, be made to drag a load up a hill, as in Scotland, why may not a man with wheels of similar construction placed under his feet propel himself along the streets at a rapid rate of speed?

A SUBSTITUTE FOR GAS in the illumination of cities; electric lights, with vertical reflectors, placed at such elevations above buildings, and at such distances apart as will illuminate the different areas of a city. A few strong electric, or calcium lights, with good reflectors, suspended, say 100 feet from the ground, would, like so many miniature suns and moons, shed a steady uniform and satisfying light upon all the buildings, alleys, and streets, embraced within a given city area. The ordinary street lamp of the gas company is placed so near the pedestrian's eye as to produce a glare and blindness instead of illumination. It is alternate glare and darkness. Unprovided with reflectors, much of the light is dissipated. An improvement on streets gas lights might be made, by suspending the lamps in the center of the street at an elevation of 20 or 30 feet, this would protect the eyes of the passers-by, and the reflectors placed above them would send their rays where most needed. The saving in lamp-posts would offset the expense of connecting and suspending rods and pipes. The whole chain of lamps in a city could be ignited by elecricity, as is now done in the dome at Washington. By means of these central lights, the streets of a city would be more uniformly and effectually lighted.

A CHEAP IRON OR STEEL RAIL, adapted to farmers' freight railways, whether worked by horses or steam; a rail which, while fitted to receive the wheel of ordinary wagons, will not collect snow and ice so as to impede travel. The importance of these horse railways as substitutes for the ordinary earth or plank road, is not yet appreciated as it deserves to be. They are destined to accomplish much as lateral feeders to long lines, and as connections of small places with large ones. Were farmers to co-operate, and, with some aid from the townships on the route, build these cheap freight railways, with single or double tracks, millions of dollars might be saved in farm outfits for transportation, and untold sums added to the productive industry of the country.

A SHIP RAILROAD, by means of which to transport large and small vessels across necks of land, such as Cape Cod and and the Isthmuses of Tehuantepec and Darien. Required a firm, wide track, with rails of great strength, and an adjustable frame-work to receive and hold the vessel in position on the track; the whole resting on trucks, to be drawn at moderate speed from bay to bay, from ocean to ocean. A steam elevator or lock at each terminus of the isthmus would place the vessel in position on the truck, or remove it therefrom. Such a railway would solve the problem of uninterrupted navigation.

SCIENTIFIC INTELLIGENCE.

PRODUCTION OF THE PRECIOUS METALS.

Up to the year 1846, the value of silver produced exceeded that of gold. In 1800, it amounted to 72·2 per cent of the entire yield, as opposed to 27·8 per cent of gold. Since 1846, the gold production has taken the lead It reached its maximum in 1853, when it rose to 80·6 per cent, and declined to 67·2 in 1868. For the year 1800, the entire production of the precious metals was estimated at 44,800 pounds of gold, valued at $3,640,000, and 1,800,000 pounds of silver, valued at $40,500,000.

For the year 1868, the estimate was 410,000 pounds of gold, valued at $143,000,000; and 3,100,000 pounds of silver, valued at $70,000,000. According to these statistics, the gold production had increased. from the year 1800 to 1868, 730 per cent, while the increase in silver was 172 per cent; in value, the increase in gold was 950 per cent, and in silver, 136 per cent. In the year 1500, 10½ pounds of silver were paid for 1 pound of gold; 100 years later, 11·6 pounds; in 1650, 13 pounds; 50 years later, 14·9 pounds; in 1750, 14·93 pounds; 1800, 15·42 pounds; 1850, 15·8 pounds; and 1869, 15·61 pounds.

ARTIFICIAL PRODUCTION OF CONIINE.

It is said that Socrates terminated his life by drinking coniine, extracted from the poisonous hemlock, *Conium maculatum*. The oily liquid is highly poisonous, and closely resembles the nicotin obtained from tobacco. The artificial preparation of this body has more than ordinary interest, as it suggests the possibility of our being able to make other alkaloids, such as quinine, morphine, and the like; and if we can succeed in this, why not prepare the less complex compounds, sugar, starch, etc.? The coniine was prepared by Hugo Schiff, by heating alcohol and ammonia at 210°, together with butyraldehyd, precipitating with a platinum salt, and distilling the product. The artificial alkaloid exhibits the same properties as the native. It is a violent poison, and in other respects is analogous to the extract from hemlock. As the first step in the synthesis of vegetable alkaloids, the discovery of Professor Schiff is one of the most important in modern chemistry.

DETECTION OF BLOOD STAINS.

Iodide of potassium dissolves traces of blood, even from clothing which has been thoroughly washed, but hæmin crystals cannot be obtained from the solution.

Gunning has discovered, in the acetate of zinc, a reagent that precipitates the slightest traces of the coloring matter of blood from solutions, even where the liquids are so dilute as to be colorless. Blood, washed from the hands in a pail of water, can readily be detected in this way. The flocculent precipitate, thrown down by the acetate of zinc, must be washed by decantation, and finally collected on a watch glass, and allowed to dry, when the microscope will readily reveal hæmin crystals, if any blood be present. This test has been repeatedly tried, with entire success.

USE OF SOLUTION OF SILK IN PHOTOGRAPHY.

Pure silk is soluble in hydrochloric acid, and if the solution be neutralized by ammonia, and evaporated, an organic chloride of ammonium results, which is capable of use in photography, particularly for salting paper. Paper thus prepared is said to be more sensitive than that salted in the usual way, and in printing, gives a warmer tone. It is thought that this salt could also be used in the preparation of collodio-chloride of silver, if it were sufficiently soluble in alcohol.

Imitation of Human Hair.

In a recent article upon the trade in human hair, it is stated that a patent has recently been taken out for converting goat's hair into hair for ladies' use; and that the experiment is so successful as to render it almost impossible to distinguish the real article from the imitation. This will be good news, not only to the dealers in hair, who might apprehend the exhaustion of their source of supply, but also to the ladies who depend upon art to compensate the deficiencies of nature. The same article states that in 1868 over 22,000 pounds of hair were imported into Great Britain, representing the clip of about 45,000 women. Much of this is obtained from the large communities of sisterhoods scattered throughout France and Belgium.

THE ICE HARVEST of 1871, on the Hudson river, is unusually large. During the winter, a vast and nearly unbroken field of ice, ten inches thick, has extended from Troy down as far as West Point, and has been crossed by the heaviest teams, and by persons in great numbers. For many weeks, the work of cutting, floating, elevating, and packing the ice has been going on along the Hudson, and all the ice houses on its banks, holding over 1,000,000 tuns, have been filled.

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Improved Steam Road Roller.

In France, in 1859, the first steam road roller was patented, by M. Louis Lemoine. This roller, which was constantly used by the municipality of Bordeaux, with excellent results, on broken stone roadways, gave rise to the Paris Steam Road Rolling Company, organized in 1862, and which adopted a steam roller patented by M. Ballaison. A modification of this roller is that at present adopted in Paris. In 1863 a roller, patented by Messrs. Clarke & Batho, was the first steam road roller ever tried in Great Britain. The chief feature of this machine is the use of three sets of rollers, two in front acting as drivers, while the third is set up in a turn-table, being adjustable so as to steer the engine, at the same time overlapping the space between the two outside drivers. One of these machines was, in 1864, sent to Calcutta, and so favorable were the official reports relative to the economy and value of steam rolling that other rollers were ordered by the Indian Government. It was in 1867 that arrangements were made whereby Messrs. Aveling & Porter determined to adapt their form of road locomotive, and its driving gear, to the arrangement of rollers and turn-table patented by Clarke & Batho. The result is the form of steam roller which illustrates this article.

If we examine mechanically the state of a rolled and an unrolled roadway, it will not be difficult to find causes for the economy in using the heavy steam roller. In the first case, there is a solid stone table, consisting of a mass of interlocked stones; in the second, a heap of loose stones, without any mutual cohesion From experiments made, it has resulted that an uncompressed heap of broken stone metalling contains 53 per cent of mass and 47 per cent of empty space. So that an unrolled road, on being given over to the traffic, only consists of, at the most, 30 to 45 per cent of stone; while, on the other hand, a well-rolled road covering contains at least from 70 to 80 per cent of broken stone, the interstices between which have been filled, especially at the top, with clean sand. An unrolled road, therefore, contains nearly three times more empty space than a well-rolled roadway. It is evident that it cannot be hard and strong until these spaces are filled up. Without rolling this can only be done by the particles ground by the traffic off the edges of the stones, by dirt and refuse. This last condition has been the objection always raised to macadam roadways constructed without the roller; its use removes this annoyance in a great degree, and moreover materially affects the durability of the pavement.

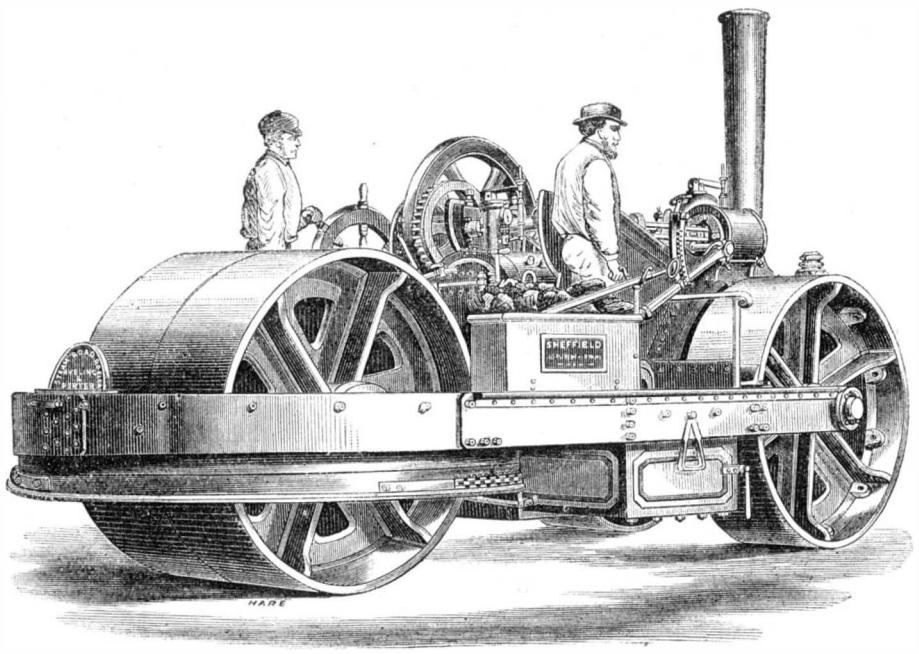
The testimony of the London authorities and others who have adopted steam road rolling is, that the duration of the roadway is increased two-fold by the application of the roller, and not only is this advantage gained by steam rolling, but by its means "the road is at once and immediately a pleasure to ride on, whereas, when not rolled, the roads are for many weeks (sometimes months) disagreeable to the rider, agonizing to the horse, and very costly to the owner of the horse."

By at once compacting the newly made roadway, and delivering it in a clean, smooth, and consolidated state ready for the traffic, the necessity for breaking the stone into very small fragments, is avoided, the use of larger stones being to give greater durability to the roadway by reason of their decreased liability to get loose in their bed, or to have the corners knocked or worn off by repeated hammering of horses' hoofs and carriages as they pass over. The fewer angles there are in a given space of stone, the less wear and tear is there, and consequently there is decreased cost in maintenance of road.

There are at the present time five of these steam rollers in use in the United States, and one is now building by Messrs. Aveling & Porter for the city authorities of New Haven, Conn.

The testimony of the authorities of the Central Park, New York, and of the Prospect Park, Brooklyn, is very favorable as to the advantage and economy of the steam roller in the construction of roads, and Mr. Culyer, the engineer of the Brooklyn Park, in a late report on their Aveling & Porter's fifteen-tun roller, says: "Running both systems—horse and steam power—under careful surveillance, we find the result to be largely in favor of steam and your roller. This result is $13·50, the cost of the effective service per day of ten horses of the road-rolling machine, as compared with $30, the cost of producing similar results by horse-power. . . . . Inasmuch as we are groping along in this matter of road construction in a way somewhat more determined than heretofore, I do not doubt that in a few years we shall conclude to make use of the immense store of stones supplied to us, at first hand, by nature, and so work up a system of ways which shall be more in accordance with the spirit of the age, serve our convenience better, and, in the long run, our pockets too. Ultimately I do not despair of seeing every town, of any note, owning its own stone breaker and an Aveling & Porter steam roller, very much to its own pleasure and profit."

Mr. W. Churchill Oastler, of 43 Exchange Place, New York, is Messrs. Aveling & Porter's agent in this country.



AVELING AND PORTER'S STEAM ROAD ROLLER.

Size of the Sun.

Let the reader consider a terrestrial globe three inches in diameter, and search out, on that globe, the tiny triangular speck which represents Great Britain. Then let him endeavor to picture the town in which he lives as represented by the minutest pin-mark that could possibly be made upon this speck. He will then have formed some conception, though but an inadequate one, of the enormous dimensions of the earth's globe, compared with the scene in which his daily life is cast. Now, on the same scale, the sun would be represented by a globe about twice the hight of an ordinary sitting room. A room about twenty-six feet in length, and hight, and breadth, would be required to contain the representation of the sun's globe on this scale, while the globe representing the earth could be placed in a moderately large goblet.

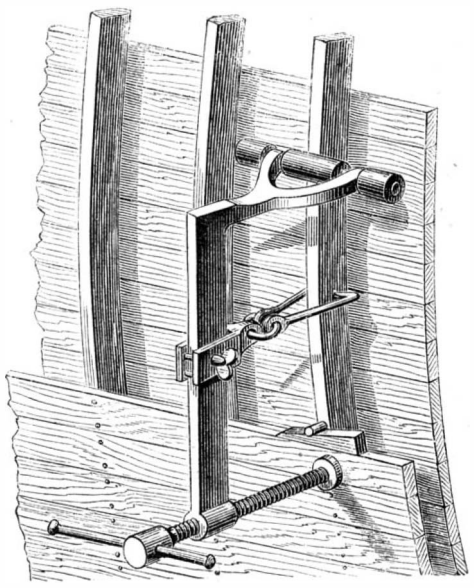
Such is the body which sways the motions of the solar system. The largest of his family, the giant Jupiter, though of dimensions which dwarf those of the earth or Venus almost to nothingness, would yet only be represented by a thirty-two-inch globe, on the scale which gives to the sun the enormous volume I have spoken of. Saturn would have a diameter of about twenty-eight inches, his ring measuring about five feet in its extreme span. Uranus and Neptune would be little more than a foot in diameter, and all the minor planets would be less than the three-inch earth. It will thus be seen that the sun is a worthy center of the great scheme he sways, even when we merely regard his dimensions.

The sun outweighs fully seven hundred and forty times the combined mass of all the planets which circle around him; so that when we regard the energy of his attraction, we still find him a worthy ruler of the planetary scheme.—*Proctor's Other Worlds than Ours.*

PLANKING SCREW.

Our engraving shows an improved form of planking screw, invented and patented by George Savage, Jr., of Bangor, Me., and designed for shipbuilder's use.

It consists of a lever, with a clamping screw at one extremity, and a bifurcated leg at the other, with roller foot bearings, which rest upon the timbers of the vessel to be



planked, as shown. An adjustable link, with grappling hooks, is also provided, which seizes the timber in the manner shown, and forms a fulcrum for the lever. By means of this instrument, planks may be bent and held to place till spiked' all of which is sufficiently indicated in the engraving, to obviate the necessity of further description.

Spontaneous Combustion.

A contributor to the Boston *Journal of Chemistry* says: Any light that can be obtained on spontaneous combustion adds not a little to the value of real estate. We believe a large percentage of the fires charged to incendiarism are really owing to spontaneous combustion, so called. We purpose giving three cases, two of which have come under our own experience.

1. Within a year, twenty-eight rolls of cotton cloth in one of our large dyeing establishments were dyed black, and were delayed a few days before they could be starched and finished. Two of these rolls were discovered to be on fire—not in flames, but in a smoldering condition, or charred into tinder; a third roll was so hot that hands could not handle the cloth and the wooden roller upon which the cloth was wound was heated almost to the point of ignition.

The rolls of cloth destroyed were the first dyed, and consequently had been longer exposed than the others, which in a measure explains why all the rolls were not in the same condition.

In the dyeing, the first rolls were dyed without washing, by an oversight of the dyer. This is the point of importance, as the chemical salts were left in the cloth. Logwood, potash, sulphate of copper, and sulphate of iron constituted the dye, and we suggest this explanation as the probable cause of the fire. The potash and sulphate of iron change to sulphate of potash and hydrate of iron, by the absorption of oxygen from the atmosphere or from moisture in the cloth, and the heat thus developed reaches the point of ignition. Cloth in drying is very liable to contain heated moisture.

2. Within a year a fire was discovered in a silk-mercer's shop in London. The fire originated in a lot of black-dyed silk, and was discovered, as in the first instance, before flame had burst out. The conclusion reached was that it was not safe to have black-dyed silk in large masses, and that each piece ought to be so placed as to allow a free circulation of air. We think it quite probable that the explanation of the combustion is the same as in the preceding case.

3. In trying to get rid of rats in a dwelling house, the floors were taken up, in order to cut off their ingress, if possible. The box that held the hot-water pipes was found to be a favorite resort for the vermin, and had actually been on fire. The sides were charred, but there had not been sufficient air to sustain combustion. Upon investigation as to the cause of the incipient fire, we are not left long in doubt, for a store of remnants of greasy cloths used in washing dishes was found, which had been brought by the rats from the kitchen. Some of these were charred, and the others were well saturated with grease andoils. This fire was quite a distance from the kitchen range, forty feet at the least.

It would be very natural in all these cases, if the real causes had not been so apparent, to attribute the origin of the fire to incendiarism.

We have a very firm impression that the introduction of coal oils for lubrication of machinery has very materially reduced the number of fires from spontaneous combustion, owing to the fact that the coal oils do not absorb oxygen; and that for this reason, if for no other, insurance companies can afford to insure mill property for less rates than they charge at present.

How a Stink Bug Utilizes Turpentine.

Mr. Thomas Meehan recently contributed to the Academy of Natural Sciences, in Philadelphia, an account of a singular habit in the common "Stink Bug" of gardens, (*Reduvius novenarius*, Say), which might lead to some important physiological discoveries by those more closely devoted to entomological studies. Wondering what made some abrasion on the bark of a *Pinus cembra* on his grounds, he was attracted by a female insect of this species near it; and noticed, that on the thigh of the middle leg, the usual grey color was of a polished black. Supposing that possibly the insect may have had something to do with the injury to the bark, through which the turpentine was oozing, he waited a few miuutes to re-assure the insect—usually timid under observation—that there was no danger. It then went to work to take the turpentine with the heel of the tarsus of the fore leg, and place it on the thigh of the second leg. It took several dozen "heelsful," winding it round the gathering ball on the leg, as one would wind a ball of string. After it had collected together a ball of turpentine about the size of a pin's head, it gently wiped it off with the femora of the hind leg, and applied it to the anus, where it was very rapidly absorbed. It then walked very leisurely to the top of the nearest branch, when it flew away. This was in the end of September. He saw no more of these insects till a week afterwards, when he cut off a small branch on which was another female and carried it to the pine tree, applying the branch to the stem, so that the insect could walk on to it without much suspicion of human agency in the matter. As soon as it got to the turpentine, it went through the same operation as the other one, taking two doses of it before it walked away; which it did leisurely, and with much apparent satisfaction. Up to this time he had not been able to find a male, so as to ascertain if it also had any similar use for turpentine.

COAL PIT FIRE.—The Bank colliery, near Rotherham, on the property of Earl Fitzwilliam, England, had been on fire for a century past, when the superintendent, Mr. T. Cooper, conceived the idea of building a wall to shut the fire into one of the workings. The plan was carried out, although the wall had to be commenced by workmen creeping on their hands and knees through dense, stifling smoke. The wall, nearly 1,000 yards long, and, in places, five feet thick, is complete, being tapped at intervals with metal pipes, through which the state of the fire can be inspected. The heat from the fire has been so great that the surface of the earth, over the workings, has produced two or three crops every year.

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Bevel-cutting Band-saw Machine.

Those who inspected the wood-working machinery exhibited at the last Fair of the American Institute will at once recognize in our engraving the representation of a substantial and elegant band-saw machine exhibited by First & Pryibill, of 452, 454, and 456 Tenth avenue, New York.

The machine attracted much attention, not only on account of its strength and compactness, but from the fact that it can be made to saw bevels while the table is kept level, the adjustment being made to the desired angle without even stopping the saw.

This adjustment is made by sliding the upper wheel laterally on an arched bar which supports its bearing. The table, which is level, works on a slide, and is connected with a lever, which lever is connected with the upper sideway slide, which slide is made to correspond with the arc of a circle, the center of which is the center of the lower shaft. The whole is operated by a hand wheel and screw.

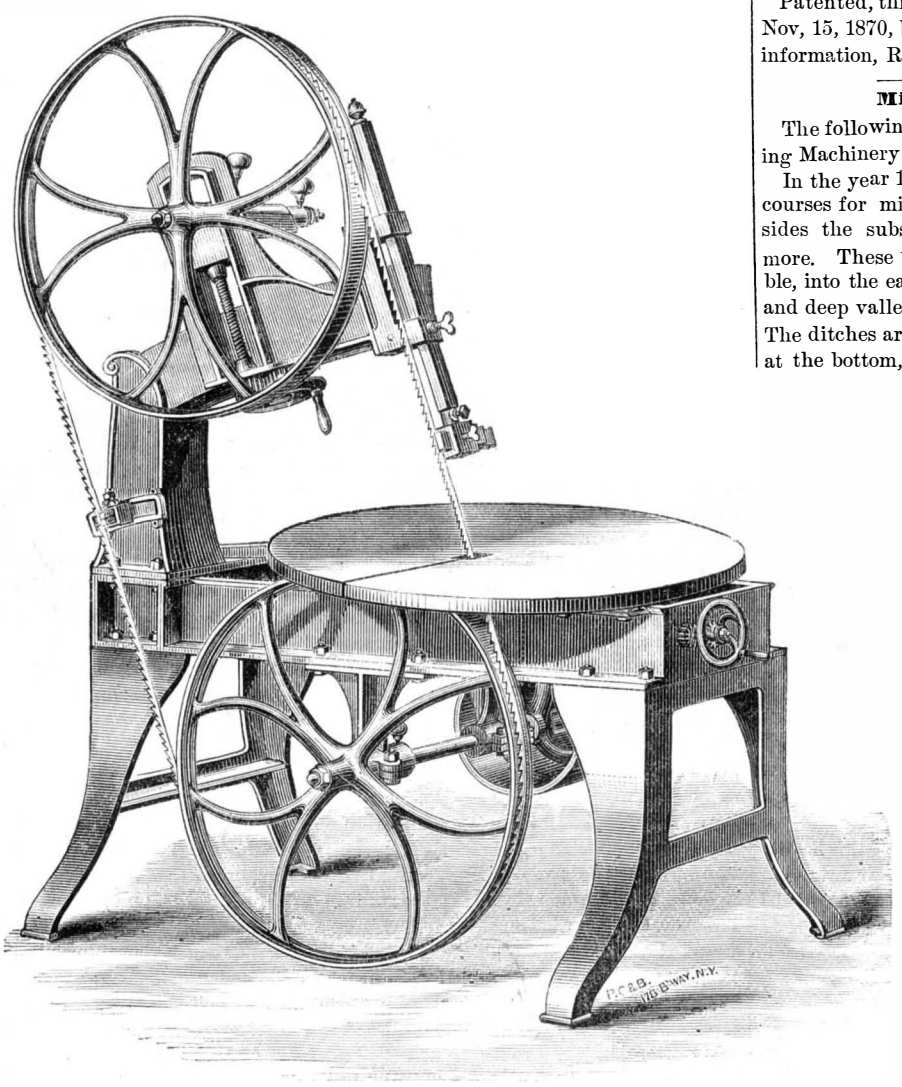
By these means the difficulties in the old method of sawing bevels on brackets, stair rails, chair work, pail work, pattern work, etc., etc., arising from the incline of the table, are entirely removed. These difficulties are the sliding of the work on an inclined table, and the trembling of the table on its pivot and segment.

In the machine under consideration the table is kept constantly level and firmly supported.

This machine, with an iron table, weighs about 1,600 lbs.; the whole hight is 7 feet 10 inches; the depth, 3 feet 9 inches; length, 9 feet 6 inches. The driving pulleys are usually 12 to 14 inches diameter, and the wheels, 3 feet 2 inches, and the speed employed 355 to 365 revolutions per minute, sawing as thick as 13 inches.

We can personally vouch for the excellence of the work done by this machine, and for its convenience in use, having repeatedly witnessed its practical operation.

The reader will find the advertisement of the manufacturers in another column.



FIRST & PRYIBIL'S BEVEL-CUITING BAND-SAW MACHINE.

A Telegraph Dispatch Tube.

The necessity of sending telegraphic dispatches from one part of a town to another, without the loss of time occasioned by going through the busy parts on foot, has induced the post-office authorities to sanction the laying down of an experimental tube in the busiest parts of the city of London. The tube is 3 inches in diameter, and is in direct communication with the Fleet Street branch from the main office. The messages, as they arrive by the wires from the provinces or the Continent, are deciphered in the usual manner by clerks, and those intended to be delivered, say a mile from the receiving office, are then inclosed in a light cylinder.

This cylinder is covered with felt, and when filled, inserted into the tube, and the flap or cover closed, when a strong current of air, being blown into the tube and behind the cylinder, forces it through to the branch office. In a recent experiment, the carrier occupied about four minutes of time to travel the distance, 2,058 yards. Shunts are provided so that the carrier can be sent in any direction, as interme diate flaps or points are closed to allow it to pass, the shutting and opening of the points being first communicated by wire. The carriers are capable of being drawn or sent back either by suction or by a blast at the opposite end.

The invention is considered of great value by the authorities, as it will expedite the delivery of the messages—in fact, something of the kind was needed from the continually increasing use made of the telegraph by the public, since it has been in the hands of the Post-office Department. We understand that Mr. Siemens, the inventor, has been authorized to extend the tube to the station at Charing Cross, with branches leading to the post-offices *en route*, so that if the working be found successful, of which we have little doubt, there will be a complete system of tubes all over London in a very short space of time.

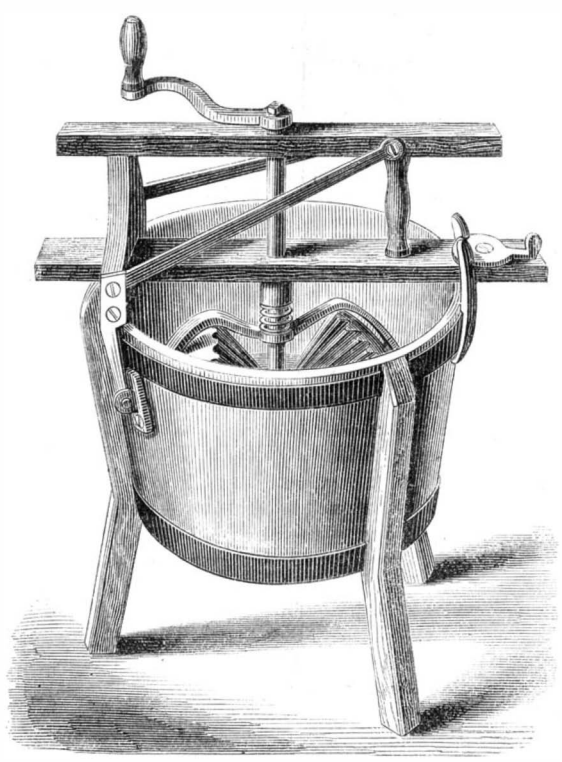
The plan will, in course of time, be employed for sending letters to the various branches after they have been sorted at the head office, and this will enable them to be delivered in about half an hour after being posted.—*London Mechanics' Magazine.*

Gold Ornaments.

Gold, the most valuable and the handsomest of natural products in general use, is, by reason of its powerful color and strong lights, not very favorable to the display of delicate modulations of surface. In large objects, highly bossed work, bold relief, or low relief set off by a mat ground, tell well, as also does engraving, whether fine or bold. Whilst possessing great strength and tenacity, it is extremely ductile, and in its native state, bends very readily. These qualities sufficiently account for the extent to which the ancient and oriental goldsmiths used fine twisted wire in the ornamentation of their jewellery. Angular or very sharp sections are not desirable, the latter giving a steel-like character to the subject; whilst thick, square edges have a "strong" effect. Slightly rounded edges and tolerably bold profiles seem best to suit the characteristics of gold. Very thin sharp edges seem to detract from the value and look poor. Very fine reliefs rising abruptly from their ground (as the wire ornament already mentioned) always tell very happily in gold, because, although ever so delicate, it provides itself a fine outline, and this is what gold seems to demand. On this account *répoussé* work in plain gold must always rise more suddenly from its ground than would be necessary with bronze or dull silver; but being once provided with this natural outline, the execution of the raised work should be rounded and soft, not abrupt and angular. Anything like like abrupt contrasts of light and shade will detract from the effect of work in gold. A certain repose is essential to the solid beauty of the material, so long as we are depending on the gold alone. If, however, we are merely using the gold as a setting for some more precious object (such as jewels), the rule may be modified. So far I have been speaking of gold having the fine dull surface natural to it in its native state. For almost all art purposes this has the most agreeable finish. At the same time we must not ignore the burnisher, which, when used with judgment, may produce excellent effects by contrasting the bright and dull surfaces, and so giving special emphasis to certain parts of the design. Burnished gold alone has rarely so good an effect.

IMPROVED WASHING MACHINE.

Our engraving illustrates an improved washing machine of



very simple construction. The principle adopted is the forcing of the suds through the goods by squeezing, instead of by rubbing which wears the textures rapidly.

Two ribbed conical rollers are pivoted to a curved cross bar, driven by a central vertical shaft and a winch, supported by suitable frame-work. This frame-work is hinged to the side of a tub or tank, as shown, so that it can be turned up for putting in or taking out the goods.

The ribbed cones are pressed down upon the goods by a coiled spring, acting between a collar on the vertical shaft and the curved cross bar. A false bottom, which also rests on springs, is placed at the bottom of the tank, and presses it upwards against the goods. This bottom is either perforated or made of lattice work, and is provided with a vertical rim, which prevents the clothing from wedging between its outer edge and the walls of the tank.

The frame work at the top is provided with a cover, not shown in the engraving, which has, on its under surface, a crescent shaped cup, placed on the hinged edge, so that when the cover is lifted, the drip will be caught, and emptied back into the tank on closing the machine.

Patented, through the Scientific American Patent Agency, Nov, 15, 1870, by Horace Warner, whom address for further information, Ridgeway, Pa.

Mining Ditches in California.

The following statements are from Blake's "Notices of Mining Machinery:"

In the year 1867 there were 5,328 miles of artificial watercourses for mining purposes in the State of California, besides the subsidiary branches, estimated at over 800 miles more. These water courses are ditches cut, wherever possible, into the earth of the hillsides, and crossing rocky points and deep valleys by means of flumes, or, better, in iron pipes. The ditches are usually about eight feet wide at the top, six at the bottom, and three feet deep. The grade varies from twelve to eighteen feet to the mile. Formerly flumes were constructed on a large scale and at great cost; but now large sheet-iron pipes are substituted with great advantage in durability and economy. Some of the flumes were of great length and hight; one near Big Oak Flat, in Tuolumne County, being 1,300 feet long, and a part of it 256 feet above the surface and supported upon wooden towers. Upon the Truckee ditch there were, at one time, 13 miles of flume, eight feet wide and four feet deep, hung upon the side of a deep cañon. Upon the Pilot Creek ditch, there was one piece of flume 300 feet long and 95 feet high.

The boards used for making flumes are usually from one and a quarter to one and a half inch thick. They are laid down rough and then battened. Sills are placed at intervals of two and a half feet, with posts and a cap for support of the flume box. The sills are four inches square, the posts three by four, and the caps one and half by four inches. In addition to the first cost of a flume, it is expensive to keep in repair, and is liable to a great many accidents. It may be burned or blown down, and if it be left dry for several months, all the boards curl up and split so that they cannot be used again. It is said that the repairs of a flume cost 90 per cent more than those of a ditch. For all these reasons, flumes are not now constructed where they can possibly be avoided, and iron pipes are substituted. These pipes are made of stout sheet-iron or boiler-iron, and vary in size from 10 to 40 inches in diameter, according to the quantity of water to be carried. From 7 to 11 inches is a common diameter, for the smaller pipes, and these are made of No. 20 iron. A sheet two feet wide and six feet long will make two joints of 11 inch pipe. These joints are put together to form sections 20 feet long, and these sections are united upon the ground and secured by means of strong wire wound around two projecting ears or hooks of iron, one upon each section. The whole pipe is also firmly fastened to the surface by posts securely set in the ground, to prevent its weight from carrying it down the steep slopes. The examples of the successful use of pipes for carrying water across depressions and ravines numerous. Upon the South Fork Canal, in Eldorado County, a pipe is used to carry 50 inches of water across a valley 1,600 feet wide and 190 feet deep. This pipe is 10 inches in diameter, the iron about one-sixteenth of an inch thick, and the supply end is ninety feet higher than the delivery. On the Excelsior Companies ditch, near Smartsville, there are five miles of low flume, 6,000 feet of 40 inch pipe, 3,000 feet of 20 inch pipe, and half a mile of 38 inch pipe. The 40 inch pipe crosses a depression 150 feet deep, and with a head of thirty two feet carries 2,500 inches of water. Upon the Dutch Flat ditch there are 3,500 feet of 31 inch iron pipe and 837 feet of 32 inch pipe.

The aggregate cost of the ditches in California for the supply of water is reported at $15,575,400 ("Langley's Directory, 1867). They are generally built by companies and owned distinct from the mining companies; and the water is sold to the miners at so much per inch per day of ten hours.

THE money contributed to the fund for the relief of sufferers in France, by the Chamber of Commerce Committee, and the receipt of which is acknowledged by Mr. Charles Lanier, Treasurer of the fund, is $98,075. The Produce Exchange Committee have also contributed $15,045, making a total of $113,120.

CANADA is the fourth maritime power in the world, and, according to the "Year Book for 1870," has 7,591 ships, with a tunnage of 899,090 tuns. She stands ahead of every nation except Great Britain, United States, and France.

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Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

[The subject of Perpetual Motion having been discontinued in these columns for the present, all articles received on this subject are placed on file, and may be referred to at some future time.]

Lunar Phenomenon.

MESSRS. EDITORS:—On the afternoon of Friday, February 3d, about a quarter before six o'clock I noticed, casually looking at the moon, as beautiful and rare a phenomenon as it has ever been my pleasure to behold. I thought at the time, and still think, it was a lunar rainbow, and if my description will justify my belief, it may be of sufficient interest to publish.

Lunar rainbows are undoubtedly very rare. I had never seen one before, and, after careful search, find no mention made of any. However, I think I recollect hearing of one seen at Brooklyn, perhaps a year or two ago, any record of which I have been unable to find.

The moon was nearly full, and at an angle of thirty degrees, or about one third risen toward the zenith. The evening was perhaps a little chilly, but quite clear, thin, fleecy clouds being scattered here and there. The moon itself was surrounded by a halo or belt of a light brown or chestnut color, for, perhaps, the distance of two radii directly adjoining the moon. Just outside of this again was another belt, of perhaps twice this width, and of a beautiful buff or golden color; and again, outside this, was a ring encircling the whole, the width of which was equal to both the others, resembling the beautiful transparent colors of a locust's wing.

The play of the prismatic colors of the rainbow in the outer ring—the green perhaps predominating, with an effect very like the light during an eclipse of the sun, *i. e.* without actinic force—was beautiful. It lasted for perhaps twenty minutes from my first observation, and, during that time, remained as I first saw it, until just before it disappeared, when it faded out very rapidly, beginning at its northwest limb, and continuing directly across to its south-west limb. When it had reached the center, it looked very much like a a rainbow turned topsy-turvy, and, if anything, was the most astoni hing and pleasing effect of the phenomenon. Actually a rainbow upset, or rather the lower half! I have never heard of such a thing before, nor can I find any similar phenomenon described. As it disappeared, a light hazy cloud drew off from the face of the moon, and, in a few minutes, the sky was clear and cloudless.

Can any of your readers give an explanation of this beautiful appearance, and whether it really was a lunar rainbow? Even if not, it was a beautiful and rare phenomenon, and I should have made a more extended and accurate view of it, had I been at leisure, or had an opportunity.

Dayton, Ohio A. C. GRUBE.

Supply of Water to Boilers.

MESSRS. EDITORS:—The supplying steam boilers with water is a subject, I think, which has not been thoroughly considered; at least I have never seen anything in reference to the proper locality for its admission.

The practice is now, as it always has been, since steam was first used as a power, to admit the water at the *lowest* part of a boiler.

I think if the cause of this never varying practice should be investigated, it would lead to an improvement, in this matter, of no small importance.

Water, when taken into the legs of a boiler, or, in other words, into a water space formed round the ash box, will remain comparatively cold for a time, it being below the fire grate; and after it has become more or less heated, it is forced up into the body of the boiler by a new supply of cold water from the force pump taking its place. Now, this practice must cause a disagreement in the expansion and contraction in different parts of the boiler; and the forcing of water into the bottom of any form of boiler has this objection in a greater or less degree.

I think the water should be heated as soon as possible, on entering the boiler, and for this reason should be admitted continually, at a uniform rate with its consumption. It should be admitted a little *below* the upper surface of the water, for, on entering at this point, it would immediately flow towards the bottom of the boiler, and, passing through the heated water, and blending with it, would absorb heat much sooner than if admitted in a body against the fire-box.

I think it would be an advantage for the feed water to take its heat from a large space *within* the boiler, rather than from a small portion of the fire-box, for various reasons. It would be heated sooner, and therefore a more even heat would be preserved throughout the boiler. There would be less fluctuation in the steam, as it would be made much more uniformly. It would also mitigate the evil of unequal expansion.

A friend tells me there would be danger of admitting the feed water at the point above mentioned, as the water would sometimes get low, and then the feed water would be taken into the steam, and thereby converted into steam so suddenly as to explode the boiler.

Now, in such a case, the steam would be condensed in proportion to the water taking its heat; but the water in this case takes no more heat than if it had entered the hot water; but it takes this heat more suddenly, for the nature of steam is such that it comes in contact with *all* the particles of water at once, and causes a sudden condensation, which, by the action of the force pump, would cause a slight pulsation in the steam. This would be partly counteracted by the steam made by the furnace at the same time; but this reaction would be slight, compared with what steam boilers frequently receive, especially where large steam hammers are used. But this never need occur.

The water in a steam boiler never should be allowed to get low; and it never would, if admitted as mentioned herein—namely, by a constant flow, in keeping with its consumption; and there is no reason why this should not be done.

Perhaps it would be well to extend the supply pipe into the boiler, and to inclose that part within the boiler, by a second pipe, so that the cold water may have no influence upon the shell of the boiler.

Water requires a certain amount of heat, varying with pressure, to convert it into steam, and from whatever part of the boiler the heat is derived, it will take no less; nevertheless, I think, for the reasons I have given, that it would be an improvement to supply the water as herein described.

I think there are many others who would be pleased to hear this matter discussed by some one of more scientific ability than myself. WILLIAM DENNISON.

Philadelphia, Pa.

[For the Scientific American.]

RAMBLES FOR RELICS.

NUMBER I.

I am neither an antiquarian nor an archæologist, in pretension, and I lay no claim to appear in print as a "scientific American"; but, having a liking for old and curious things, which has led me, for the last two years, to look about and into earth works, mounds, shell heaps, stone piles, cave sepulchres, and other remains of the primitive people of Tennessee, I assume the privilege of recording in your journal some of my observations. The field of my late rambles is in Jefferson county, not far from the railway station, at Strawberry Plains. Near that village the Holston river, flowing from the East, turns in a northern direction, and, after accomplishing a circuit of five miles, comes back to within half a mile of its former course, shaping a tract of land known as "The Bent." The river is called Holston, according to Haywood, from the circumstance that an explorer of that name, from Virginia, in 1658, discovered it, and was one of the first settlers upon its banks. By the same authority, it was known to the Cherokees by the name of Watauga. Ramsey, however, calls it Hogohegee, from its source to its confluent French Broad (Agiqua), and Cootcla below, to where it meets Little Tennessee (Tannasee). On an English map furnished for the use of British officers serving in America in 1766, the Holston is put down as the Kallamuckee, from its source to Little Tennessee. On Mitchell's map of 1776, the river now known as the Tennessee is the Hogohegee to French Broad; above, to its head, the Holston. This was the "storied" river of the Cherokees. Their fatherland lay beyond the "Big Mountain," (Allighanee). In the course of migration, their settlements were extended down French Broad and Little Tennessee to the principal river, forming the "Overhill" middle and lower towns.

My attention was directed to the Bent of the Holston, hearing that a stone image—not a "giant," but a dwarfed representation of the human form—had been discovered in a cave of one of the limestone ridges of the district. The idol (a real antique) was exchanged for a bushel of wheat, and sent to Knoxville; hence it passed through successive hands to Washington, and it now occupies a conspicuous place in the archæological cases of the Smithsonian Institute.

The ordinary relics of the ancient Cherokees, scattered in the valleys of the Tennessee and its tributaries, occur at the Bent; such as flint arrow and spear heads, axes, hatchets, cores, flakes, pestles, fragments of pottery, and rough, discoidal stones, called weights, used probably as rollers in a game of skill, described by the old trader and author, Adair. Rambling from this class of remains to those, left by the same race, I noticed traces of an arena, or chunkyard—a place of amusement and exhibition, where captives in war were sometimes immolated—within an elevation of earth a foot and a half high, inclosing a space twenty-five feet in diameter. In the center, in a plain raised above the surface, was a post hole, which had held the stake to which the victim was fastened. The area resembles "the ring" of a circus in the fields, after the covering is removed. It was an ancient inclosure, to judge by the depth of soil formed upon it; the ground had never been disturbed by the plow, and I am quite sure that Rice and Van Ambergh never presented the combined attractions of circus and menagerie in the face of gigantic trees two hundred years old. About twenty paces from the area, nature had provided a convenient space for spectators, on an inclined plane.

Objects of a higher grade of art than any that have been mentioned, which probably belonged to a different people, are sometimes turned up by the plow. Of such as were brought to me, after they had been thrown aside as worthless, but which rose astonishingly in their flight of valuation—many being too high to be reached by my short means—I specify a disk, with a round edge, cut in silicious rock, five inches in diameter and an inch and a half thick, having a shallow cavity in both of the flat sides, and a perforation in the center of the plane; a cup-shaped utensil of a fine variety of earthernware, coated with a dark, shining pigment which would be called glazing, if the art of the glazer had been known to the potters of the "Stone Age"; the imaged head and neck of a sea-duck, in argillite, evidently a fragment; and for a rare specimen of taste and skill in representing forms in stone, the combined figures of a pipe and bird—an orifice in the end, communicating with the bowl of the pipe on the back of the image.

The head and neck, in the outline, characterize a buzzard at rest, looking down upon its prey. Any one who has observed the traits of this species of hawk must acknowledge the resemblance. The object, which is sculptured in a fine variety of mica slate, is five inches long and weighs more than two pounds. It was found by a laborer, on the west bank of the Holston, at a point where the freshet of 1867 had washed away two feet of the surface soil.

On the east side of the river an ancient mound was observed in the Bent, near a curvature in the bank, which has been scooped out to form a beach or landing place. This had been occupied, evidently, by the recent Indians, for their misshapen earthenware in fragments, rough hatchets, and arrow heads, were found in the locality. There, without a flight of a century back, fancy might figure the warriors of the last tribe that roamed through the cane meadows of the Holston, assembled, before embarking in their canoes, for an onslaught down the river, into the "Creek country;" or, after their return from a successful expedition, with "fresh scalps."

Tradition spoke of a "town hall" or council house up on the mound, and a passage to the center, underground, from the river. Of the last, there were no signs. The occupancy, but not the erection, of similar structures, "artificial mounds" for public uses, by the Indians, is mentioned in the narratives of the earliest explorers of the country, now known as Tennessee.

Log or wood inclosures, in ruins, on hillocks made by art or on natural bluffs, are pointed out by persons living who remember that the natives described them as places for public meeting. The same race sometimes buried their dead in the mounds. This fact, in connection with the other, though it is important to the investigator, in ascertaining their character and in separating original from accidental deposits, need not confound him, as it has done some authors. Noah Webster supposed that some earthworks, which he examined at the West, were put up by the followers of De Soto, for fortifications. The annular evidence of certain trees, an evidence which is accepted in such instances by the highest authorities, throws the date of the construction beyond the time of this explorer.

Respecting the mound under our immediate notice, the "oldest inhabitant" reported that when his father drew the first furrow around it, large oak trees grew upon the summit. Being now without any protecting vegetation, and having been plowed over for seventy-five years, it has lost its original proportions. It retains the shape of a truncated cone, fifteeen feet high, and one hundred and sixty-eight feet in circumference, at the base.

An excavation to the bottom, eight feet in diameter, showed its composition to be, chiefly, compacted sand-loam, with such an intermixture of clay as would come from the removal of surface soil with portions of the substratum. Two large pits or sink holes, hard by, probably contained some of the building material. From the cavity were thrown out, at intervals, for several feet down, charcoal, ashes, burned clay, and fragments of pottery.

The first regular deposit was reached at a depth of four feet, six or eight feet below the original summit. It consisted of splinters of wood and strips of bark partially decayed, laid horizontally. Beneath this layer, after the soft black earth and mold, in which it was embedded, were cut through, the outline of a human skeleton appeared, lying on the left side, the head being towards the east, and the leg bones doubled up on the chest, a position regarded, at first, as accidental, but which conformed to the mode of burial throughout the mound. The bed of earth rested upon a clay foundation, two or three square yards in extent.

The organic remains were well enough preserved to allow removal of the skull and the principal bones of the trunk and the members, entire. Below these remains, there appeared at various depths, from two to four feet, two or three skeletons on the same level, laid in the same manner, with a covering of wood and bark. Skeletons were found down to the bottom of the excavation—no particular position having been observed as to the cardinal points.

Parts of eight skeletons, including eight entire skulls, were removed. The absence of implements and utensils of various sorts was remarkable, in the burial place of a people known to have been in the habit of depositing with the dead their most valued effects. Fragments of earthenware, composed of a paste mixed with silicious particles or pulverized mussel-shells, alone rewarded my curiosity. I had observed in the wall of the cavity, four feet from the top, part of a cedar post three feet long, and four or five inches thick, set in an upright position.

My assistants, who could conceive of no other reason for my operations than a mercenary one (and who regarded the relic as a pointer to a pot of gold "hid by the Indians were they left the country," which had come to my knowledge by the spontaneous turning of the forked twig of an apple tree, held firmly by each hand, or by some necromancy of that sort), made extraordinary efforts to reach the treasure. The mattocks clanked upon some loose stones which were thrown out in such haste as prevented a thorough examination of the pile. Broken vessels, charcoal, burnt earth, ashes, shells, calcined bones of animals, among which were those of the deer, indicated that the structure was a hearth or fireplace, perhaps an altar of offering to the Sun, by fiery rites.

Without finding gold for an encouragement, our labors were renewed on the west side of the mound, by digging a trench ten feet wide, twelve feet long, and from twelve to fifteen feet deep, to meet the central opening. At the depths of five feet a layer of wood and bark covered the form of a child, apparently about six years old. It was laid with much care, perhaps by the hand of affection; a tortoise-shell covered the head, and a string of pearl beads encircled the neck. Three feet from the skeleton, in the same plane, one of a fe-

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male was exposed, and upon the sunken ribs lay the bones of an infant. Beads and a cruciform shell ornament were with these remains. Nearer the central cavity a rotten cedar post, like that which had excited the cupidity of the workmen, was observed, corresponding with others describing a rectangular figure. Within the space lay a skeleton on its side, doubled up in the usual manner, and distinguished by its size from all others exhumed during the excavations.

The skull was large and round. The intellectual development would have pleased Dr. Gall or Mr. Fowler. The maxillary bones had full rows of sound teeth; and those of the trunk and limbs must have belonged to a man of massive build, about six feet high. Ten large beads, perforated lengthwise through the center, cut from the column of a marine shell, eight flint arrow points of slender shape, and sharpened at the base to be fitted to the shaft, were found on one side of the skeleton; an implement of polished serpentine, which, I imagine, was the battle ax of the chief, whose mortal remains were under my observation, was on the other. The points, only an inch and a quarter in length, had the delicate shape and finish of a class of objects usually found only in the mounds. The rough and clumsy heads, chipped from flint and other quartz rocks, and scattered over the plain, do not occur among the primary deposits, in any of these structures.

The rotted cedar posts were signs of a mode of burial in wood enclosures, practiced by the ancient people. These were made not by hewing and fastening stakes, for their connections had no marks of the ax or the hammer, but by placing logs and pieces of timber one above the other against upright posts, so as to support a roof of the same material. Remains of similar vaults have been disclosed in other mounds, one of which was examined by myself at "The Forks" of the Holston and French Broad, and another near Chattanooga, opened during the late war. While I am writing, a publisher's account comes to me of a "visit to an Indian mound in East St. Louis," in which narrative "a square structure," with "sides lined with wood," "wooden columns," and "cedar posts" is mentioned.

In an earth mound opened near Newark, Ohio, in 1850, a trough covered with logs, contained the skeleton of a man. (Smithsonian Report, 1866.) A similar object was disclosed in a frame of wood, at the bottom of an ancient mound, by Squier and Davis.

In the further prosecution of our work, ten skeletons, invariably doubled, but laid without order as to their relative positions, under wood and bark, and portions of ten others were discovered, at various depths. Several skulls were obtained entire, and the bones of a single frame. The solid parts of most of the remains, having lost their animal consistency, easily crumbled. Eight feet down the cavity were the first signs of incremation. A layer of red clay, several yards square, covered a mass of earth, ashes, charcoal, charred bones, calcined shells, broken vessels, and carbonized seeds of a species of plant, probably the cane, the stalks of which had evidently been used in the burning. This layer rested upon another bed of clay, burnt to the hardness and color of brick. These were indications of a usage of the mound building race in Tennessee—burning their dead with their treasures, in connection with the carcass of a domestic animal or one of the chase. When the remains were partially burnt, earth was thrown upon the pile, smothering the flame, which had an extinguisher in the clay layer.

Various implements and ornamental articles found in this cavity, are to be described hereafter.

PROGRESS OF FOREIGN INVENTION.

SMELTING BY PETROLEUM.

A novel application of petroleum oils in smelting furnaces has just been patented in England by J. F. Parker and E. Sunderland, of Birmingham. The inventors take petroleum or other like volatile oil, and place it in an air-tight cistern surrounded with a covering or jacket, and into the said jacket they introduce boiling water, or, by preference, steam; or, by means of a coil of piping within the cistern, and under the surface of the oil, through which piping steam is passed, they raise the oil to the required temperature. They prefer a temperature of about 212° Fah. The top of the covering or jacket is provided with a self-acting valve regulated to the desired pressure. Through an inlet pipe, they pass a current of air over the surface of the petroleum or volatile oil, which air becomes thereby carburized or charged with the vapor of the oil. By an outlet pipe, they conduct the carburised air into a larger pipe entering the tweer of the blast furnace or cupola employed in the manufacture or melting of the iron or steel, which larger pipe constitutes a common conduit, into which all the gases and vapors, supplied to the furnace or cupola at the tweer, are passed, and by which they are conducted to the furnace or cupola. The inlet and outlet pipes are each provided with a tap. In a retort or close chamber, exposed to heat, the inventors place chloride of lime or bleaching powder, intimately mixed with about one eighth its weight of dry crushed charcoal, coke, or other carbonaceous matter. The object of the chloride of lime is not stated, but it is probably intended to dry the air passed into the hydrocarbon vapor.

TREATMENT OF MINERAL OILS.

This is a Scotch invention, and has for its object the removal of the objectionable blueness, cloudiness, or apparent turbidity which occurs in various mineral oils, and the invention consists in adding, to the mineral oil, a substance which is soluble in or mixable with the oil, and of the class known as nitro-compounds, and obtained by treating hydrocarbons with nitric acid. Nitro benzole is the substance of the class which is used, and the inventor finds that the commercial quality of it, which generally also contains other nitro compounds, answers the purpose. The proportion of nitro-benzole to be employed in each case will vary with the quality and condition of the mineral oil—in other words, with the more or less purified or refined state of the oil, and with the amount of blueness present.

CUTTING TOBACCO.

An English invention for the above purpose is intended to cut timber, tobacco, and various substances, not by a saw, nor by a knife pressing merely against the substance, but by a knife or knife edge made very sharp, and moved in the manner of a saw, so as, in fact, to constitute a saw, whether band, circular, or any other saw, but formed without teeth; and he applies a stationary sharpener, consisting either of a piece of hone, steel, or other suitable material, or of a succession of those pieces, to the edge of the moving knife, so as to make the knife edge rub against such sharpener set at a proper angle with the edge, whereby the edge is constantly sharpened in the same way in which any knife is sharpened on a hone, only that in this case the motion is continuous. The inventor employs circular, band, or reciprocating knives to cut timber and other substances, in substitution of saws, whereby the cutting is effected with the production of a smooth surface and without waste; and he also uses such knives or knife edges moving, not merely like a chopper, against the substance to be cut, endways like a saw, to cut tobacco and all kinds of fibrous or other similar substances requiring to be cut cleanly and without jagging.

DECOLORIZING SIRUPS.

The inventor of this process takes ethylic (common vinous) alcohol or methylic alcohol, known as wood spirit, or a mixture of these two, known as methylated spirit, and he adds, to the alcohol to be employed, either caustic ammonia or caustic soda, potash, or lithia, or any of their salts that have causticity and are soluble in the alcohols named. To the alcohol, thus rendered caustic, he adds impalpable charcoal, and heats up, in the case of the ammonia alcohol, to from 100° Fah. to 130° Fah. In the case of alcohol and the three fixed alkalies named, he heats to 180° Fah., using proper means and sufficient condensing power to prevent loss of material.

PUDDLING FURNACES.

The object of this invention, patented by J. Russell, of Cinderford, England, is to protect puddlers from heat. The invention supports, parallel to and at a short distance from the front of the furnace, three vertical screens, two of the said screens covering the front of the furnace, on either side the puddling door, and the third screen nearly covering the said door, the hole in the door through which the puddlers' rabble passes being left exposed. Each screen is made, by preference, of a plate or slab of cast or wrought iron. The edges of the middle screen or plate project over the inner edges of the side screens or plates, and the said middle screen is supported by a chain passing over pulleys, and provided with a counterbalance weight. The side plates or screens are supported, in front of the furnace, by being hooked or otherwise fastened thereto. The heat radiated from the furnace, at that side on which the puddler stands during the puddling operation, is received upon, and absorbed by, the screens or plates described, and the said puddler is thus protected from the distressing heat of the said furnace.

IRON TUBES.

The following method of making iron tubes is the invention of H. Kesterton, of Birmingham, England. In making the tubes, the inventor reduces pig iron to the state of soft malleable iron by the Bessemer or other similar process, and casts it into a hollow cylindrical ingot. He passes this ingot, whilst still very highly heated, through a series of pairs of grooved rollers set in different planes, say alternately vertical and horizontal. The first pair of rolls takes the ingot, and reducing and elongating it, passes it to the second pair immediately beyond, and this pair passes it to a third pair, and so on, until the desired reduction is obtained. Each successive pair of rolls is driven at a surface speed greater than that of the rolls immediately in front, so that allowing for the elongation of the tube and the reduction of the section, equal quantities of metal may pass between all the pairs of rolls, gripping the ingot in equal times. A stationary mandrel passes between all the rolls, and carries a bulb at the nip of each pair of rolls.

DYERS' RECIPES.

From Haserick's Secrets of Dyeing.

DARK BLUE SUITABLE FOR THIBETS AND LASTINGS.—Boil 100 pounds of the fabric for one hour and a half in a solution of 25 pounds of alum, 4 pounds of tartar, 6 pounds of mordant, 6 pounds of common extract of indigo; cool them as usual. Boil in fresh water from 8 to 10 pounds of logwood, in a bag or otherwise, then cool the dye to 170° Fah. Reel the fabric quickly at first, then let it boil strongly for one hour. This is a very good imitation of indigo blue. Chemic can be used in the preparation; but should the shade require more of the indigo while finishing in the logwood, extract of indigo ought to be used.

The old English way of coloring a blue-black on lastings, is by boiling 100 pounds of the fabric for one and a half hours in a solution of 10 pounds of alum, 1 pound of copperas, and 1 pound of blue vitriol; take the goods out, cool them, and boil them for one hour in a dye containing 10 pounds of logwood. This color would not look well on soft goods, such as thibets, as in fact it is only a dark slate; but it looks better on lastings, on account of its gloss.

N. B.—To all these colors the logwood can be boiled in large quantities, say a barrelful in a hogshead of water at a time, 2 pounds of logwood being reckoned to a pail of liquid. This will save boiling the chips in a bag. Five pails will be equal to 10 pounds of chips. It has this advantage, too: more can be easily added if the shade require darkening. Extract of logwood should never be used for blues, as it will produce dull colors on account of its being disoxidised by time.

SAXON BLUE.—100 pounds of thibet or comb yarn, 20 pounds of alum, 3 pounds of cream of tartar, 2 pounds of mordant, 3 pounds of extract of indigo, or 1 pound of carmine instead; the latter makes a better color. When all is dissolved, cool the kettle to 180° Fah.; enter and handle quickly at first, then let it boil half an hour, or until even. If the fabric be not scoured clean, it will look shady; and about 5 pounds of common salt added will remedy this. Remember, long boiling dims the color. Zephyr worsted yarn ought to be prepared first by boiling it in a solution of alum and sulphuric acid, then the indigo added afterwards. For common coarse carpet yarn, it is only necessary to handle it through a hot dye of 175° Fah., containing 15 pounds of alum 10 pounds of sulphuric acid, 4 pounds of chemic paste, to 100 pounds of yarn, or through its equivalent of extract of indigo. If chemic be used, the dye ought not to come to a boil, otherwise the impurities of the indigo will color the yarn and dull its brilliancy. Rinse well in water before drying. The tin acid fastens the color somewhat. It will not fade so easily, nor run into the white, if wove into flannels, which have to be scoured in soap, and bleached. The color changes in the sulphur house into a stone green shade, but the original color comes back again when the fabric is rinsed again in water.

PRUSSIAN BLUE.—Prussiate of potash was formerly only used on cotton, with a preparation of iron first; and, about the year 1828, was first used on woolens, and, of course, no one then thought that they could be colored without giving the fabric a preparation of iron, before entering into the prussiate of potash solution. Every dyer had his preference to one or the other solutions of iron; they were nitro-muriate of iron, acetate, and tartrate of iron. Some used iron oxide (burnt copperas) dissolved in sulphuric acid, etc.; but later, the yellow prussiate was only used until the introduction of the red prussiate of potash. The latter has the preference, as it can be added, for darkening the shade while in the process of coloring, which is not the case with the yellow prussiate of potash; but this would rot the cloth, as this color requires a large quantity of acid. To 100 pounds of wool or flannel dissolve 8 pounds of red prussiate of potash, 2 pounds of tartaric acid, 2 pounds of oxalic acid, 5 pounds sulphuric acid. Handle the fabrics in this for half an hour at 120° Fah.; then reel the goods out, and heat to about 165 Fah.; add 5 pounds of sulphuric acid, and 1½ pounds of tin crystals; stir all well; enter the goods, and handle for half an hour longer; then heat it to 208° Fah., when it will be a good blue. The shade can be varied to any extent by the addition of logwood liquor and a few pounds of scarlet spirit; but the liquid ought to be cooled first, and the goods handled quickly to secure evenness while in the logwood. This color ought never to boil, especially when coloring with steam, as more than boiling heat (212°) destroys the color and makes it lighter; but letting the fabrics lay a few hours exposed to the oxygen before rinsing is an improvement to the color. This color must be well washed or else it will smut. This blue will be brighter if aniline purple be used for darkening, instead of logwood; but this ought to be done after the goods have been washed, and in fresh water. If a mordant of 10 pounds nitric acid, 36° B., 10 pounds muriatic acid, 22° B., 10 pounds sulphuric acid, 66° B., diluted with water, and 1 pound feathered tin added, be used, instead of sulphuric acid, the color will be fast.

ANILINE BLUE.—To 100 pounds of fabric dissolve 1¼ pounds of aniline blue in 3 quarts of hot alcohol; strain through a filter, and add it to a bath of 130° Fah.; also 10 pounds of Glauber's salts, and 5 pounds of acetic acid. Enter the goods, and handle them well for twenty minutes; then heat it slowly to 200° Fah.; then add 5 pounds of sulphuric acid diluted with water. Let the whole boil twenty minutes longer, then rinse and dry. If the aniline be added in two or three proportions during the process of coloring, it will facilitate the evenness of the color. The blue, or red shade of blue, is governed by the kind of aniline used, as there is a variety in the market. Hard and close wove fabrics, such as braid, ought to be prepared in a boiling solution of 10 pounds of sulphuric acid and 2 pounds of tartaric acid before coloring with the aniline, as this will make the fabric more susceptible to the color. Blues soluble in water color more easily than those which have to be dissolved in alcohol.

Colored Fires.

A member of the German artillery corps gives the following formulæ for making colored fires:

1. White light: 8 parts saltpeter, 2 parts sulphur, 2 parts antimony.
2. Red light: 20 parts nitrate of strontia, 5 parts chlorate of potash, 6½ parts sulphur, 1 part charcoal.
3. Blue light: 9 parts chlorate of potash, 3 parts sulphur, 3 parts carbonate of copper.
4. Yellow light: 24 parts nitrate of soda, 8 parts antimony, 6 parts sulphur, 1 part charcoal.
5. Green light: 26 parts nitrate of baryta, 18 parts chlorate of potash, 10 parts sulphur.
6. Violet light: 4 parts nitrate of strontia, 9 parts chlorate of potash, 5 parts sulphur, 1 part carbonate of copper, 1 part calomel.

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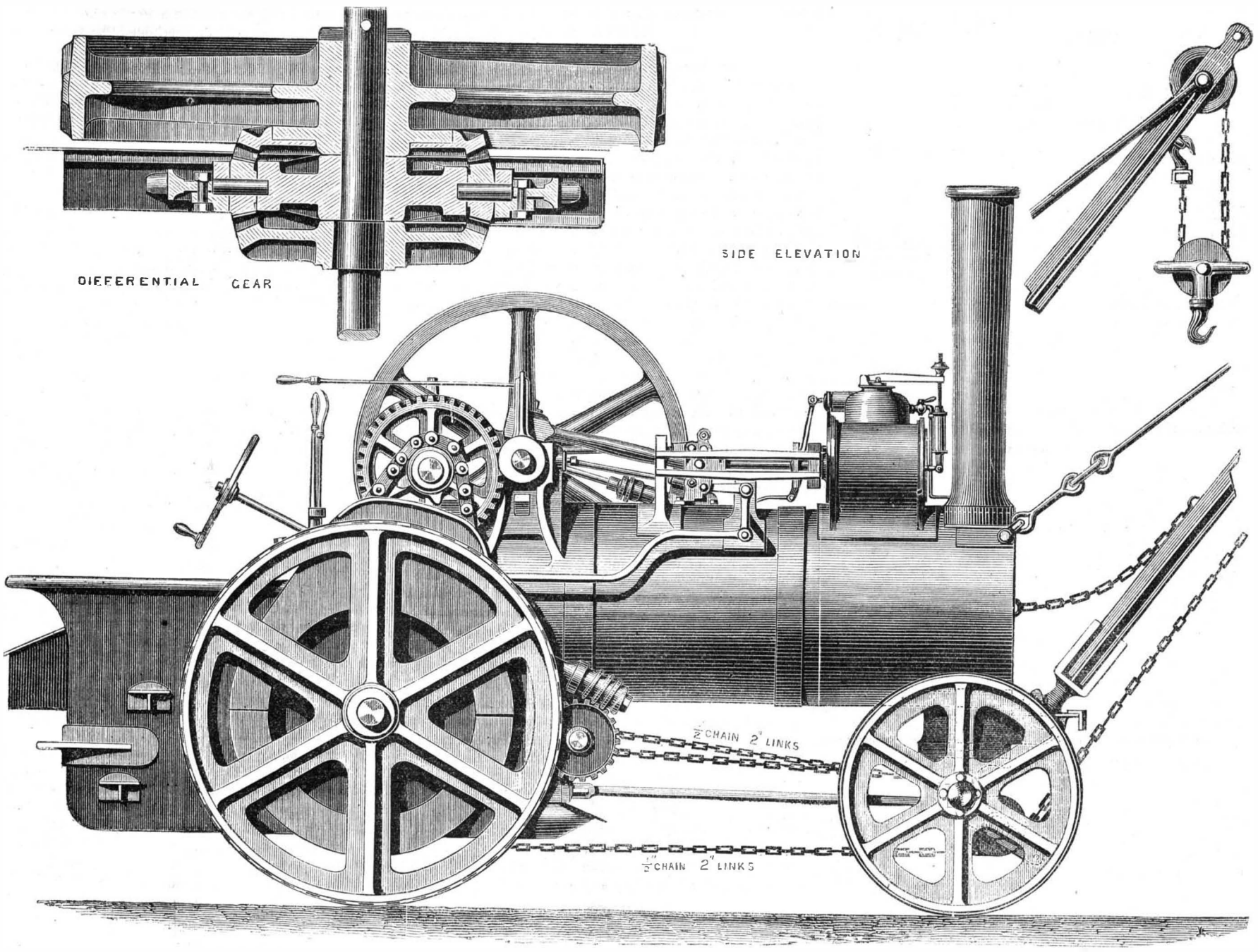
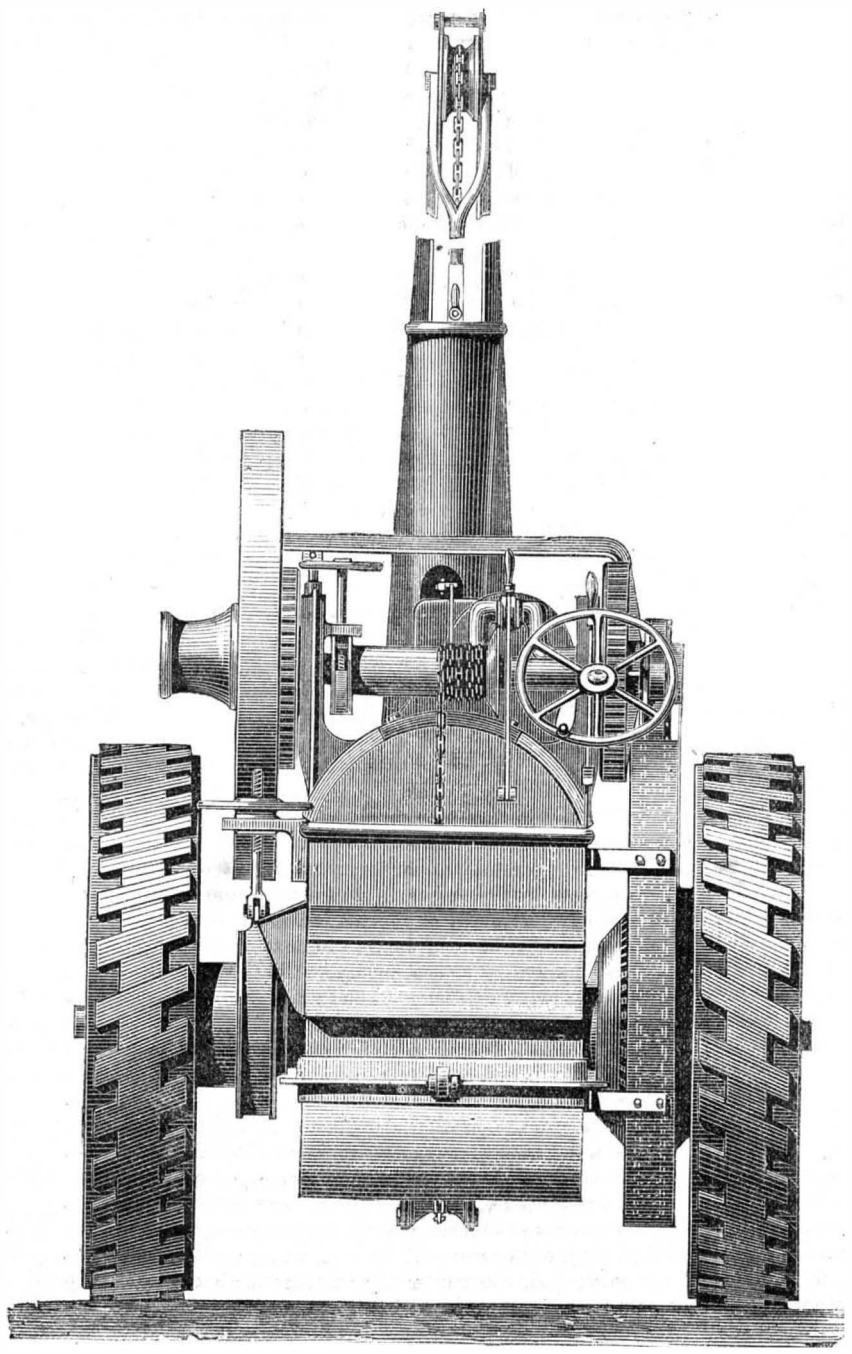


AVELING & PORTER'S COMBINED ROAD LOCOMOTIVE AND PORTABLE STEAM CRANE.

The combination of a road locomotive with a steam crane will of itself suggest many useful applications. Such machines will be found of considerable value for contractors, shipwrights, manufacturers, and for use in dockyards, quarries, etc. They are made to lift from one and a half to three or four tuns, and, when the engine is required for ordinary hauling, the crane can be detached with little trouble. The general characteristics of Messrs. Aveling & Porter's ordinary road locomotive are adhered to in this engine; and in Europe, where numbers of them are constantly in use, they have been found a handy and economical means for lifting and lowering heavy weights, removing heavy material and packages of various descriptions.

There is considerable novelty in the detail of the construction of the machine, apart from its combined advantages of a crane and road locomotive.

The crank shaft drives directly a countershaft immediately behind it, which is, at the same time, the shaft of the winch barrel. From the countershaft a pitch chain drives the main axle, or rather one of a pair of bevel wheels of a "jack-in-the-box" motion on that axle, which gear, though strong, is worked into a very small space between the fire-box and the off driving wheel. The bevel next the fire-box is keyed fast on the axle, and that outside, next the off wheel, is in one with the wheel; the motion of both wheels is, therefore, under ordinary circumstances, equal; but when unequal resistance takes place, a certain play is allowed between the driving wheels. It would, however, be inexpedient to leave the engine always at the mercy of this compensating arrangement, and therefore the near wheel is releasable, as in all Aveling's engines, from the axle, by withdrawing a pin in the box; and the off wheel can be clamped on the axle, by placing a clutch on the outside of the wheel over the grade pin, and catching the spokes of the wheel. The winch barrel moves free on the countershaft till thrown into gear, at the same time that the locomotive motion is thrown out, when only the crane is required. The hoisting chain is passed under the boiler and up over the gib, which is simply formed of two T-irons, then pivoted on a ball and socket joint capable of turning in any direction.



The steering chains are taken reversely on to a horizontal shaft under the boiler, which is worked by a worm and pinion, which can be managed from the foot plate; and so convenient are all the arrangements that the whole management of the machine—driving, steering, and working the crane, is under the control of one man.

At the last exhibition of the Royal Agricultural Society, at Oxford, England, these engines were employed in removing the machinery to and from the show yard.

Mr. W. Churchill Oastler, 43 Exchange Place, New York, is Messrs. Aveling & Porter's agent in America.

Objections to Practical Use of Oxygen in Illumination.

We have referred on several occasions to the use of oxygen as an illuminator on a large scale, and to the many advantages claimed for it by the inventors of the different processes. It is now stated, on the other hand, however, that the entire process of manufacture has many grave practical difficulties, especially in regard to the preservation and the distribution of the gas; since iron reservoirs and pipes, especially when moistened, are so liable to be attacked by the oxygen as to be soon rendered useless, thus requiring some new material for this purpose. The illuminating apparatus also requires to be totally changed, and unless the mixture of oxygen is made with the greatest exactness, the idea of the economy of the illumination is illusory. Furthermore, the intensity of the light is very variable, according as the oxygen is more or less mixed with air and moisture. So far as it regards the economical introduction of this method of illumination, the ordinary gas companies are assured that they have nothing to fear from competition.

MICROSCOPIC PHOTOGRAPHY.—A further proof of the value of this invention is shown by the letter of a French correspondent, which says that a pigeon lately arrived in Paris, bearing dispatches, which, when printed, filled four columns of a newspaper; and also private communications to the number of 15,000. The photographs were inclosed *in aquill*, tied to one of the bird's feathers. We hope the conclusion of peace will not stop this interesting work.

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THE TRANSMISSION OF POWER BY COMPRESSED AIR.

The subject is becoming more and more a question of importance, and some capitalists have even gone so far as to signify their willingness to risk their means in making the attempt, in two places where water power is abundant, as we mentioned on page 49, Vol. XXIV. It certainly would be a great convenience to obtain power, for driving machinery, from a pipe, in the same way as we do our gas and water; and the risk of fire and boiler explosions would be done away with. Le us consider whether the economy of the idea is equal to its other advantages.

Up to the present time, compressed air for obtaining or transmitting power, has been chiefly employed in tunnels and mines. At the Hoosac Tunnel, and that under Mont Cenis, it is and has been an invaluable servant. At the former, just now, the headings are, roughly speaking, one and a half miles from the points where the air is compressed; that at the east end being forced into the receivers and pipes by water power, every two drills requiring a four-foot turbine wheel to supply the necessary air, while the west end air is compressed by steam power, each pair of drilling machines requiring about twenty horse power. The air is compressed, into large receivers made like ordinary shell boilers, to about sixty pounds per square inch, and conducted thence into the tunnel, and up to the headings, by eight-inch cast-iron pipes, of twelve feet lengths, flanged into each other and bolted together, rubber rings or gaskets being used at the joints. These pipes are almost perfectly air-tight, and, in a distance of one and a half miles, do not afford more than four pounds of friction, per results, in pressure at the headings. The drilling machines have a reciprocal motion, the cylinders being from three and a half to four inches in diameter, by one and a half foot stroke, and, with fifty-six pounds pressure, ordinarily make two hundred and fifty strokes per minute.

So far as rock drilling is concerned, it appears that there is a loss of about sixty per cent of the power required to compress the air, as an engine of eight horse power, with sixty pounds pressure of steam, acting directly, would undoubtedly drive two machine drills. Separate compressing engines are used for supplying air for ventilation, which needs from three to four pounds pressure, through similar pipes.

The great question is, can air power be transmitted long distances with advantage? We are of opinion that it can, up to a certain distance, provided the compressing power costs comparatively nothing beyond its prime cost; but, for longer distances, we must shake our heads.

It is true that in a pipe ten miles long, closed at the further end, the pressure will be the same at the closed end as if it were only ten feet long; but when the air is in motion there will be friction. The result of calculations and observations afforded us, seems to indicate that the friction, for a constant velocity, is in direct proportion to the length, and inversely as the inner circumference of the conducting pipe.

A certain percentage of supply over consumption should be allowed in a long pipe, as there will be more or less leakage; but, with this exception, when the pipe and receivers are indicating the necessary pressure, no more air will need to be compressed at one end than is used at the other; and we see no reason why the question does not resolve itself into, "How much air must be compressed at one end to balance friction and leakage, in a given time, and to furnish a required amount, in the same time, at the other?" The practical answer to this is a mere matter for calculation, and can be readily arrived at; but there is, we think, a point at a certain distance (according to the size of the conducting pipe) from the compressing power, where the expenditure and supply would exactly balance, any less distance showing "profit," any greater, "loss," so that the distance it would be profitable to conduct compressed air depends on the bore of the conductor. The greater the bore, the greater the proportion of profit, as it were, up to a certain point, and beyond that the greater proportion of loss.

Suppose it would cost about $260,000 to furnish a pressure of sixty pounds, at the end of an eight-inch pipe twenty miles long. This pipe would supply certainly no more than 100 horse power, and it would certainly take 250 horse power to keep up the supply of air, which would have to move through the pipe at a high velocity, making the loss by friction very serious. Would 100 horse power, supplied continuously at $150 per annum per horse power, be a profitable investment on an outlay of $260,000?

Suppose we take the largest size pipe admissable, one of thirty-two inches diameter. This would cost, including compressing machinery, in round numbers, $1,550,000, and the compressing power required for full capacity of pipe would be not less than 2650 horse power. The effective result would be about 1000 horse power, which, at $150 per annum per horse power, would be $150,000. This would not be a profitable investment of capital, even without any risks, and no deduction has been made for keeping the pipe and machinery in order, or for running expenses, which, however, would not be very great.

As this pipe is as large as could be reasonably used with safety, and, for other reasons, it follows, according to the above estimate, that the cost for transmitting air power a distance of twenty miles through a pipe of thirty-two inches bore, would be, in the case of 1000 horse power (its utmost capacity), about $1,550 per horse power, ten per cent of which would be $155, or $5 more than each horse power of steam would cost at present. But the large pipe pays better than a smaller one.

Therefore we are of opinion that twenty miles is too great a distance for transmitting compressed air, and, from above data, it is easy to find the point of limit to which it can be sent advantageously to supplier and consumer.

With respect to receivers at the distance of several miles from compressors, we would advise each consumer to have his own, as no general system of receivers would be sufficiently large to be of any service, besides adding enormously to the first cost and subsequent repairs.

An additional pipe alongside another of the same size would just double the cost, without any particular benefit accruing.

PAYNE'S ELECTRO-MAGNETIC MOTOR.

A wildly enthusiastic editorial in the *Journal of the Telegraph*, the organ of the Western Union Telegraph Company, on a new electro-motive power, said to have been discovered by H. M. Payne, and now in operation in Newark, N. J., has excited very great interest in the public mind, The article has been extensively copied, and widely read; and as it predicts the dawn of a new era in the mechanical world, and comes from a source which ought to be an authority upon such matters, many, no doubt, believe that really an immense advance has been made in electric science, and that the long desired cheap and economical electro-motor has at last made its advent.

The editor of the *Journal of the Telegraph* has had an advantage denied to us, namely, the opportunity to inspect the machine while in operation. It is understood that, because several scientific gentlemen, thoroughly versed in electric science, have seen it, and discredited the claims made for it, that the parties interested are not inclined to allow any further examination on the part of those whose opinions are not known beforehand to be likely to be favorable. We are, therefore, unable to speak from personal knowledge, in regard to this machine, but we can say that men whose judgment is considered reliable in electric science, pronounce the claims of Mr. Payne to be a humbug. It is but fair to say, however, that some believe Mr. Paine to be really doing all he claims to do, and that there is no kind of deception practiced.

The principal points of the construction of this engine, from what we are able to learn, seem to be the breaking of the circuit of each magnet successively, before it has drawn its armature to the center of attraction, and the making of the circuit in the next one of the series, so that the primary force, of the latter, acts together with the residual force in the former, and in the same direction, (instead of opposing each other, as in other electro-motors), besides keeping the battery current constantly unbroken; also, the peculiar form of the magnets, by which it is claimed their attractive power is enormously increased—so much so that, it is stated, a 50 pound magnet has been made to sustain 120 tuns, with a battery of four Daniell's cups, such as are ordinarily used for telegraphing. If these claims can be made good, the public will know it in due time.

We are informed that an engine, designed to develop 500 horse power, is either commenced or soon to be constructed.

These, in brief, are the facts in relation to this matter, so far as we can gather them from various sources, including the rhapsodical articles of the *Journal of the Telegraph*.

Now, a word as to the theory of the new motive power. It is claimed that the battery is merely the connecting link, so to speak, between the machine and some mysterious storehouse of magnetic energy, and that it is no more the source of the power than the trigger of a musket is the source of the power which projects the ball. This looks to us like sheer fudge. We are not prepared to believe that any power whatever is derived from any source but the battery, and we should expect to find the consumption bearing an exact relation to the power developed.

The *Journal of the Telegraph* states that the power developed was rated at two horse, yet "two gentlemen, weighing 170 pounds each, endeavored to stop the motion of the wheel by the pressure of a concave brake, having a surface six inches by four, bearing on the belt wheel, but *without visible effect*) The italics are ours.) Now, any mechanic knows that unless the power developed was much greater than the estimate, this statement cannot be correct, (unless the motion was enormously speeded down to the belt wheel), and some would even suspect that there was concealed battery power, which could be drawn upon in case of an emergency. Surely, a brake pressure of 340 pounds, directly applied, would produce *some* visible effect on an engine of only two horse power.

In a second article on this subject, the journal referred to says: "We have the data of an examination by an experienced engineer, who gives the result of his examination as follows: Number of cells of battery, 4; number of revolutions per minute, 340; diameter of pulley, 12 inches; pressure of brake, 65 pounds; developed in horse-power, 1·99 to 2."

Not knowing the coefficient of friction of the brake and pulley, we, of course, cannot say positively that the above statement of power is not correct; but, allowing the highest coefficient of metals on wood, given by Mr. Rankine, in his work on "Machinery and Mill Work," page 349, *i.e.*, 0·6, a computation from the data given gives only 1·262 horsec power, instead of 1·99 to 2, as claimed. The latter result can only be obtained by using the entire pressure of the brake as resistance, an error an experienced engineer would not be apt to make. Perhaps, however, what is printed "pressure" was intended to mean resistance; if so, the horse-power claimed is sustained by the data.

If, as the writer of the first article referred to asserts, the battery power is only an initial force, which opens some hidden valve for the entrance of an indefinite quantity of some other force, and the size of the battery, and its consumption, need not be increased, to obtain increase of power, then we may as well cease the search for a perpetual motion, for its existence is demonstrated.

We are inclined to regard these expressions of opinion as the hasty effusions of a too sanguine observer, rather than as the sober statement of solid judgment, based upon knowledge. Whether true or erroneous, such statements made in the present stage of the invention, can only induce skepticism in the public mind, a skepticism which we regard as entirely justifiable under the circumstances.

EFFECT OF COLD UPON IRON AND STEEL.

We publish in another column a condensed statement of experiments and opinions of some engineers of high standing, upon the effect of cold upon the strength of iron and steel, the sum of which was that these metals were not rendered brittle by low temperatures. Our readers' attention will scarcely need to be pointed to the fact that most of the experiments of Joule and others were made by steady pressure, and therefore cannot be considered reliable when percussive force is brought into play.

It seems almost superfluous to argue that power applied percussively produces very different effects from simple dead weight; but when men like Joule, Fairbairn, and Spence, ignore this difference, it is fair to suppose that less skilled engineers may also ignore it. That there is a difference in these effects, so great that no relation between them can be determined, any one may convince himself by contrasting the tensile strength of glass with its extreme frangibility under percussion. We maintain, therefore, that, in so far as they go toward settling the question whether rails and tires on railways are more liable to break in cold weather than in warm weather, their experiments and the opinions based upon them are alike valueless.

Mr. Brockbank, whose paper drew forth the opinions referred to, took the ground that iron and steel were more liable to break in cold weather, and based his opinion upon percussive experiments. It is obvious, therefore, that his opinion has no weight upon the subject of tensile strength as affected by cold, but it is of great value as confirming experiments previously made to ascertain the effect of cold upon iron and steel subjected to percussion, experiments of which Mr. Brockbank was apparently ignorant at the time his paper was prepared.

In 1869, a "Treatise on Iron and Steel," by Knut Styffe, was published in London, from a translation by Christer P. Sandberg. The translator, however, took issue with the author upon this very question, and denied the applicability of Styffe's deductions, from tensile experiments, to percussion in cold temperatures, founding his denial upon experiments performed by himself in Stockholm under the authorization of the State Railway Administration of Sweden, in 1867. The results of his experiments prove that at 10° Fah. rails will not sustain much more than one fourth the blow that they will at 84° Fah. The method of performing the experiments, as well as the details of each, are given in tabulated form in a voluminous appendix to the translation of Mr. Styffe's treatise.

Mr. Sandberg concluded from his experiments that the brittleness of iron and steel under low temperatures is due to phosphorus present in the metal, and that with purer metal, the results would have been different.

It is evident that this subject is imperfectly understood, even by the highest authorities, and further extended investigations, with all kinds of iron and steel, must be made before the general effect of cold, as inducing brittleness under percussion, can be affirmed. Meanwhile, it seems to be well

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settled, that the tensile strength of iron and steel when tested by stretching, is not lessened by low temperatures. On the contrary, it would seem from Mr. Spence's experiments to be increased rather than diminished.

MR. COOPER'S RECENT GIFT TO THE MECHANICS OF NEW YORK.

Mr. Peter Cooper has given one hundred and fifty thousand dollars to the trustees of the Cooper Union, in addition to the million dollars previously bestowed by him on the institution, to be expended in the purchase of books for a free reading room, and for such other purposes as the trustees may elect, for the benefit of the mechanics of New York. To call this act princely munificence, is a very inadequate expression of the appreciation in which the citizens of New York hold the last generous deed of Mr. Cooper. A prince who steals his wealth can easily afford to be liberal; one of nature's noblemen, who earns his money by the toil of his hands, when he bestows his wealth, gives what belongs to him, and is entitled to vastly more praise.

Mr. Cooper, in early life, was too poor to pay for instruction, and was compelled to acquire knowledge in the intervals of toil and at great disadvantage. He resolved that if fortune should favor him, he would found an institution in which the poorest mechanic could obtain gratuitous instruction in the evening, in such departments of learning as would add to his usefulness and chances of success in his career. Having felt the want, he knew how to apply the remedy; and, in after years, as fortune smiled upon him, he did not, as many others have done before him, forget the promise of humbler days, but set too work to carry out his intentions in his life time, and under his own energetic supervision. The Cooper Union was founded and dedicated to science and art. It has prospered under his hand. Competent teachers have been engaged to give instruction to the thousands of mechanics and women who have applied for admission. The free reading room has been thronged by persons who have gone there to prepare articles for the press,or to snatch a little information in the intervals of their work.

The School of Design for women has opened up a field of usefulness to a large class of society which has very limited opportunities for earning a support. The large hall of the Union has been the theater of popular scientific lectures before immense audiences, and thus the seed sown is scattered in every direction; and the beneficent influences of the Cooper Union are felt in the workshop and family circle by a class of persons who would otherwise have been excluded from these advantages.

There is something grand in the conception and execution of a plan of such magnitude as this; and it is rarely that the privilege is accorded to any one in his lifetime to do so much good.

The occasion of the new gift by Mr. Cooper was the anniversary of his eightieth birthday. He has "by reason of strength," attained four score years, but this strength cannot be "labor and sorrow" to one who has called down so many blessings on his head. The gratitude of the poor is a rich inheritance, and our mechanics know how to thank those who have helped to lessen their toil and to elevate their condition.

Mr. Cooper has long been anxious to see the whole of the Institute building devoted to the purposes of the foundation, but it has been necessary to provide an income to meet expenses; and to do this, the various stores and rooms of the lower floor have been let. The room thus taken up for the purposes of trade is greatly needed for the collections of apparatus, minerals, ores, and drawings required by the pupils; and it would be a handsome mode of expressing their appreciation of what Mr. Cooper has done, if the wealthy manufacturers of the city were to contribute a fund, the interest of which would equal the rent to be derived from the stores. We should like to see the whole edifice swarming with persons in search of knowledge, while the money changers find a resting place elsewhere.

It would be a just recognition of Mr. Cooper's claim upon the respect of the community, if our citizens were to raise a fund for the endowment of the institution which he has established at an expense of a million dollars. We dare say that every mechanic in the city of New York would cheerfully give a dollar towards such a testimonial fund, if the movement could be organized by responsible persons. It would be a beautiful thing to see the declining years of the good old man sweetened by these evidences of regard, and, as he has taken care, during his life time, to accomplish all this good, it would be well for the recognition of it to come while he is yet able to understand and appreciate it.

DEATH OF THOMAS BRASSEY, THE GREAT ENGLISH RAILWAY CONTRACTOR.

The subject of the present obituary notice, whose death is announced in our latest foreign exchanges, was one of the great men of his time. His field of labor was one that does not generally attract the attention of the world, yet Mr. Brassey was widely known in both hemispheres, as the most extensive railway contractor in the world. He is said to have left the largest personal estate ever administrated upon in England, and this wealth was not acquired by stock jobbing and speculation, but in the legitimate business to which he devoted his life.

Mr. Brassey was born at Baerton, England, in 1805. At the age of sixteen he was apprenticed to a surveyor, and was taken into partnership by his instructor at the end of his term.

His first contract of importance was ten miles of the line of the Grand Junction Railway from Liverpool to Birmingham, in 1835. This contract proved profitable to himself and satisfactory to the company.

His next great contract was on the London and Southampton Railway, exceeding in amount four millions of pounds sterling. One would think such a contract as this was business enough for one man, but not content, Mr. Brassey undertook at the same time portions of the Chester and Crewe, and the Manchester and Sheffield Railways, besides entering into partnership with Mr. W. McKenzie, o execute the Glasgow and Greenock line. These gent'emen, still remaining. partners, undertook in 1840 the construction of a French railway from Paris to Rouen.

Between 1844 and 1848, Brassey and McKenzie contracted to construct five other French railways, and Mr. Brassey, on his own account, contracted to build three lines in Scotland and two in England and Wales. It is stated that Mr. Brassey had at this time 75,000 men in his employ, and that the weekly wages paid by him amounted to from fifteen thousand to twenty thousand pounds sterling.

T e last of the various works named, the Great Northern Railway, was finished in 1851. From this date up to the time of his death, Mr. Brassey was engaged, for the most part singly, but at times in partnership, on the following works: Works in Shropshire, Somersetshire, and the county of Inverness; the lines of the Sambre and Meuse, the Dutch Rhenish, the Barcelona and Mataro, and the Maria Antonia Railways, in Belgium, Holland, Prussia, Spain, and Italy; the Grand Trunk Railway, in Canada, 1,100 miles in length; six more railways in France; six more in Italy; the Bilbao and Miranda line in Spain; arious contracts in Norway, Sweden, Denmark and Switzerland, and the temporary railway over the Alps at Mont Cenis, which he built and maintained, at considerable loss; contracts in Turkey, still unfinished; the greater part of the East India Railway, the Calcutta and South-Eastern Railway, and other works in India; several hundred miles of railway in Australia; contracts for the first railways constructed in South America, and docks at Callao, in Peru; contracts for making, extending, or widening thirty-one English and Welsh railways; the construction of the Barrow Docks, and the Runcorn Viaduct.

The contracts performed by Mr. Brassey and his partners, from 1848 to 1861, comprised over 2,374 miles; and amounted to twenty-eight millions of pounds sterling.

This astonishing record leads the reader naturally to ask what manner of man this was, who could manage successfully a business, whose ramifications embraced the entire civilized world? The various obituary notices which have appeared in our foreign exchanges, unite in attributing to Mr. Brassey modest tastes, liberality in his views, large but unostentatious charity, the utmost keenness and sagacity in looking out for his own interests, extreme caution in preliminary examination before entering upon a contract, with remarkable boldness in making large contracts when his judgment was formed, and strict integrity in fulfilling the spirit as well as the letter of his agreements. He was extremely systematic in everything, and remarkably clear in all his statements. These qualities, united with an untiring energy and a physical constitution that enabled him to endure an amount of labor sufficient to break down three ordinary men, exactness in the minutest details of business, unruffled calmness under all circumstances, kindness of heart, and justice in his treatment of subordinates, make up a character rarely met with, and which might safely be predicted to win in almost any occupation. The greatest prosperity did not seem to elate him, and the heavy losses he sometimes sustained affected his composure as little as his gains.

One of the principal elements of success in his career, was his reliability in the performance of work as agreed. This character, established in his earlier contracts, was maintained in all his subsequent works.

In 1866, Mr. Brassey lost a sum larger, it is said, than any one business man of his time could have lost without bankruptcy, yet he died one of the richest men of the period.

In another column will be found an anecdote of Mr. Brassey, which illustrates the character of the man very forcibly.

THE PRESENT AND THE PAST.

NUMBER IV.—TRANSPORTATION

To moisture, either as affected by changes of temperature, or as containing in solution corrosive gases, as the chief agent in disintegrating rocks, we must add the chemical and mechanical agency of plants, and even the wear and tear of the surface, produced by the movements of animals upon it. The volcano, also, from the loose ashes and scoriæ which it ejects, readily contributes a share to the burden of the rain-flood; and as the materials thus set loose travel downwards, they receive constant additions from the beds of the rapid streams, in which the incessant fretting of the pebbles and grit gradually wears away the hardest rock. Thus the water of a river must contain material derived from every part of its course; and the greater the variety of rocks in the region which it drains, the more varied will be the character of its sediments. Nor does it contain matter merely "in suspension," such as will, when movement ceases, settle to the bottom as sediment; but, being a great solvent, it always contains substances "in solution," which will only be deposited, or "precipitated," by some change in the chemical condition of the water, or be withdrawn by the agency of the plants and animals that inhabit it. The mud that settles at the bottom of a tumbler of dirty river water, is an example of a sediment; the fur that is deposited in a teakettle, on boiling the same river water, is carbonate of lime that was held in solution. Our readers must forgive us for lingering upon such elementary facts; we do so because people, generally well informed, will use these terms with the greatest inexactitude. Thus we have, even while writing this article, chanced upon the phrase, in a leading newspaper, "the sediment was held *in solution*" in the flooded waters of the Tiber, the words evidently referring to matter existing, mechanically divided, in suspension therein.

Everything tells us that the river, though a great destroyer, is no restorer. When a mountain brook, brawling riotously over its rocky bed, whirling along, in its quietest times, pebbles and sand, and, in the excitement of a flood rolling down even vast boulders, subsides to the majestic river, carrying along only the finest sediments, it may, from time to time, spread layer upon layer of alluvial soil over its banks, or gradually silt up its deep pools; but, sooner or later, geological changes will occur; its outlet will be lowered, it will become rapid, its course will change—now cutting here, now there, and thus itself, eventually, removing the same soil that it had laid down, and transferring the materials a stage further towards their ultimate goal. The extensive new-made lands, that form the deltas existing at the mouths of so many of the largest rivers, can scarcely be said to be the work of the river, since they are due to the action of the tides and marine currents, that prevent it from sweeping its burden out into the ocean. But even these, if we may judge from the infrequency of such deposits in geological formations, have but small chance of being permanently preserved. Being generally loose aggregations, bordering on, and even extending out into, the sea, they are the first to be devoured when a change of level, or an alteration in the direction of the currents, gives them over as a prey to the waves. Not that deposits from fresh water do not occur frequently, and of great extent, in the geological series, but these appear to have been formed mostly in lakes. Thus the river, in its geological aspect, is the link between the continents of the Past and those of the Future, a striking emblem, even from the scientific point of view, of the ever lapsing Present.

When the substances, swept down by the river, at last reach the sea (which they do in a very finely divided condition, as silt, or the finest grained sand), they become mingled with the materials abraded by its waves. The depth to which the action of the waves extends is, as we have said before, limited, so that the abrasion of the land only takes place in comparatively shallow waters. Violent storms, however, disturb sediment that has temporarily subsided at greater depths, and tides and other currents sweep finely-divided materials far out into the depths of the ocean. As, however, marine currents are never sufficiently violent to carry heavy materials, the movements of pebbles, boulders, and even of coarse gravel, can only be accomplished in the neighborhood of coasts, within the breaker action, where, as shingle, they will be tossed and retossed, continually rounding and being rounded, polishing and being polished. At each returning wave, the grating sound, as the pebbles are thrown forward and sucked back, tells you that every stone moved has lost some almost infinitesimal portion of its substance, just as surely as your grindstone wears, by being used, or your knife, by being constantly cleaned.

Thus most of the pebbles we see on a beach are ground to sand and dust, which, when reduced fine enough, will be borne off to sea; and we also learn from this history that pebbles can only accumulate permanently by being drawn back by the waves, in violent storms, into deeper waters, or by such a rapid change of level of the coast-line as shall raise or sink them out of reach of the waves, more rapidly than the latter can grind them up. It is essential to recollect those facts in studying the history of the conglomerate rocks that occur so frequently in geological formations; at the same time, however, we must not forget that it has been suggested of late that some of such conglomerates, containing large boulders, may have been accumulated by the agency of icebergs and glaciers, and may, therefore, indicate the recurrence of several glacial periods in the world's history; periods such as that, of which we have conclusive evidence, which, over a large part of the northern hemisphere, intervened between the Tertiary period and the Recent.

Excluding, however, these possible exceptional cases, pebble beds in a geological formation indicate to us, just as certainly as shingle in an existing sea does to a navigator, a coast near at hand; that, in fact, the geologist is somewhere near the dry land that bordered the ancient sea whose deposits he is studying. The navigator would, moreover, tell us that, as a general rule, the further from land, within soundings, the finer the nature of the deposit on the sea bed. Outside the pebbles he may reasonably expect to find gravel; outside the gravel, sand; beyond the sand, gritty mud; and still further at sea, impalpable ooze. This is precisely what we should infer from the carrying powers of waters; as the strong currents, originating in the confined channels near the shores, expend themselves in the open sea, they will deposit first sand, then mud; while finally, where no off-shore currents prevail, the very finest particles will subside. The same effect virtually takes place if you agitate a mixture of gravel, sand, and dirt, in a tumbler, and leave it to settle; excepting that, instead of the sustaining power dying out in time, as within the limits of the tumbler, it continues to exhaust itself contemporaneously over the range of the current. In this rule of the distribution of sediments, we have the true key, as we shall show, to one portion of the history of geological formations; a key that, pointed out long since, has, strangely enough, never been made to serve its real purpose until very recently, and remains even now unappreciated by the majority of geologists.

The general rule of the distribution of deposits is often obscured in areas where currents are numerous and constantly shifting; and we may there find a difficulty in tracing out upon a chart, such an exact disposition as above described.

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But from the very fact that the currents in such a region are so variable, thus constantly removing what they have but recently laid down, it will be less likely that their deposits will be preserved, and in our present geological studies we may disregard the exception, save to remember that it exists.

A PHILANTHROPIC TEMPERANCE MAN.

Our readers will find in another column an advertisement, for which the writer pays us one hundred and ten dollars. It offers a prize of five hundred dollars for a plan to suppress the sale of intoxicating liquors and tobacco in New Jersey. This prize is offered by a man too modest to have his name published, but who has provided guarantees of his good faith, which will be found upon perusal of the advertisement in question.

However much the possibility of securing the desired result, by the offer of such a prize, may be doubted, the man who offers it has given practical proof of his earnestness in the cause of temperance.

The field chosen for the exercise of inventive genius is a peculiarly difficult one. If our memory serves us, there is a town in New Jersey known as Hoboken, which has been a favorite Sunday resort for New York guzzlers, ever since the Sunday liquor law went into operation in this State. The man who can devise a way to prevent drinking in Hoboken will prove himself a genius of no mean order, and will fully earn the prize offered.

The Lyceum of Natural History.

The New York Lyceum of Natural History celebrated its fifty-third anniversary on the 27th of February. This organization includes, on its list of members, all of the leading scientific men of the city, and its reputation, as an active publishing society, is high in this country and in Europe.

The report of the treasurer showed the society to be out of debt, with a handsome surplus, to be carried to next year's account. During the year, Volume IX. of transactions has been completed. One hundred and six learned societies, from all parts of the world, exchange transactions and proceedings with the Lyceum, so that our New York institution is rapidly accumulating a library of great value; it does not, however, speak well for the city that the society has no permanent resting-place, nor any proper receptacle for its library and collections.

It was announced that Mr. Waterhouse Hawkins would address the next meeting, on the "Rehabilitation of extinct animals," with illustrations and drawings.

NEW PLASTIC MATERIAL.—A beautiful plastic substance can be prepared by mixing collodion with phosphate of lime. The phosphate should be pure, or the color of the compound will be unsatisfactory. On setting, the mass is found to be hard, and susceptible of a very fine polish. The material can be used extensively, applied, in modes that will suggest themselves to any intelligent artist, to high class decoration. The inventor has given it the somewhat pretentious name of artificial ivory.

TILE DRAINING.—Draining tiles, laid without collars, can be protected at the joints by laying the tiles close together, and wrapping a newspaper, two or three times folded, round the ends. This plan is better than using straw, shavings, or grass, and, when the earth is packed down on the tiles, is perfectly secure.

NOTICE TO ADVERTISERS.—The circulation of the SCIENTIFIC AMERICAN having so largely increased, we are compelled to go to press hereafter one day earlier than formerly. Advertisers must bring in their advertisements as early as Thursday to insure their publication in the next issue.

TWO HUNDRED tuns of silver ore per week pass through Salt Lake City.

A SHAFT is being forged at the Bridgewater Iron Works, Mass., that will weigh forty-two tuns.

THE new hammer in the Bessemer Steel works at Harrisburg, Pa., weighs 35,000 pounds.

[ADVERTISEMENT.]

American Institute.--Judges on Bandsawing Machines.--Singular Decision.

It is notorious that in late years the American Institute, at their bi-annual Exhibitions, award their premiums in a somewhat unaccountable, loose manner, generally rewarding new improvements and mechanical skill with second-rate premiums, and machines which are merely exhibited for advertisements, with first; this we, the undersigned, have experienced to the full extent, at the late Exhibition, and we think it the most glaring blunder to award a second premium for an entirely new and useful improvement, and a first premium to a second-rate machine, without any improvements; and such was the decision of those judges. The fallacy of this judgment is apparent to every one, after a short explanation.

Our aim has been, for several years, to construct a Bandsaw Machine, which will cut bevel, twist, and square, without inclining the table. After spending a great deal of time and money, we have accomplished this, and have had the first machine of this construction in constant operation, at the late Exhibition, sawing three times as much as any other rival machine, the largest as well as the finest pieces of work ever sawed with a Bandsaw, and and to our knowledge it was found by all and every practical mechanic, and especially men in that business line, the most useful, practical, and finest piece of machinery of its kind. It is so constructed that if the operator desires to cut bevel, he turns a wheel below the table, connected with a lever, and he removes the upper wheel to any desired bevel, and simultaneously moves the table, which is always kept level, and all this is done without stopping the machine. No wood slides, no work is spoiled, no saw is in danger of being broken, and the whole change is made in less than half the time it would require to incline a table.

This Machine was awarded the Second Premium.

If, on the rival Bandsaw Machine, the operator desires to saw bevel, he must be very careful not to have his work slide from the table, as he works on an inclined plane, and heavy blocks he cannot saw at all.

Such a Machine rece ved the First Premium.

If the judges be not competent, why not ask them to resign, and have others appointed that are? And if, as they claim, the Managers cannot find competent men to serve, why not let the exhibitors of each branch elect their judges, as they formerly did, and no fault could then be found with the Managers of the Institute?

But, no! the exhibitor is entirely ignored on that question, and is at the mercy of a judge, who sometimes does not take interest enough for improvements, but is influenced by the biggest show, smooth talk, etc.

The American Institute was organized for the upbuilding of the manufacturing trade, and the encouragement of inventors; but such a course, as the above mentioned, cannot fail to discourage the same, and discredit the Institute.

We need hardly to mention that we by no means shall accept the awarded Second Premium, but refuse the same most emphatically.

452 10th Avenue, New York city. FIRST & PRYIBIL.

Says the Muscatine, Iowa, "Courier":

"We ha ve done, and are still doing, business with quite a number of advertising agencies, throughout the country, and have no fault to find with them; but Messrs. Geo. P. Rowell & Co. give us more business than any other. Furnishing a large amount of advertising, and paying promptly, has put this house at the very head of agencies, and has made them a name for honesty, reliability, liberality, and promptness, which of itself is worth a fortune.

Dyspepsia: Its Varieties, Causes, Symptoms, and Cure. By E. P. MILLER, M.D. Paper, 50 cts.; Muslin, $1. Address MILLER, HAYNES & Co. 41 West Twenty-sixth st., New York city.

Vital Force: How Wasted and How Preserved; or, Abuses of the Sexual Function, their Causes, Effects, and Means of Cure. By E. P. MILLER, M.D. Paper, 50 cts. Address MILLER, HAYNES & Co., 41 West Twenty-sixth st., New York city.

New Patent Law of 1870.

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FOR Twenty-five years, MUNN & Co. have occupied the leading position of **Solicitors of American and European Patents.** During this long experience they have examined not less than *Fifty Thousand Inventions*, and have prosecuted upwards of THIRTY THOUSAND APPLICATIONS FOR PATENTS. In addition to this they have made, at the Patent Office, *Twenty-Five Thousand* Special Examinations into the novelty of various Inventions.

The important advantage of Munn & Co.'s American and European Patent Agency is that the practice has been tenfold greater than that of any other agency in existence, with the additional advantages of having the aid of the highest professional skill in every department and a Branch Office at Washington, that watches and supervises cases when necessary, as they pass through Official Examination.

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Inventors who desire to consult with MUNN & Co. are invited to call at their office 37 PARK ROW, or to send a sketch and description of the invention, which will be examined and an opinion given or sent by mail without charge.

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is made into the novelty of an invention by personal examination at the Patent Office of all patented inventions bearing on the particular class. This search is made by examiners of long experience, for which a fee of $5 is charged. A report is given in writing.

To avoid all possible misapprehension, MUNN & Co. advise generally, that inventors send models. But the Commissioner may at his discretion dispense with a model—this can be arranged beforehand.

MUNN & Co. take special care in preparation of drawings and specifications.

If a case should for any cause be rejected it is investigated immediately, and the rejection if an improper one set aside.

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is made to clients for this extra service. MUNN & Co. have skillful experts in attendance to supervise cases and to press them forward when necessary.

REJECTED CASES.

MUNN & Co. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report; and in case of probable success by further prosecution and the papers are found tolerably well prepared, MUNN & Co. will take up the case and endeavor to get it through for a reasonable fee to be agreed upon in advance of prosecution.

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and MUNN & Co.'s charge for preparing the necessary papers is usually from $10 to $12.

REISSUES.

A patent when discovered to be defective may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE-MARKS, & COMPOSITIONS

Can be patented for a term of years, also new medicines or medical compounds, and useful mixtures of all kinds.

When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. There should also be forwarded a full statement of its ingredients, proportions, mode of preparation, uses, and merits.

CANADIANS and all other foreigners can now obtain patents upon the same terms as citizens.

EUROPEAN PATENTS.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels, Berlin, and other chief cities. A amphlet containing a synopsis of the Foreign Patent Laws sent free.

MUNN & Co. could refer, if necessary, to thousands of patentees who have had the benefit of their advice and assistance, to many of the principal business men in this and other cities, and to members of Congress and prominent citizens throughout the country.

All communications are treated as confidential.

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NEW BOOKS AND PUBLICATIONS.

A DICTIONARY OF WORDS AND PHRASES USED IN COMMERCE with Explanatory and Practical Remarks. By Thomas McElrath, late Chief Appraiser of Merchandise at the Port of New York. Part I., pp. 72, 8vo. New York: N. Tibbals & Son.

The application of science to the arts, and the increase in the number of commercial articles, have been so great during the present century, that special dictionaries of the words and phrases used in each science or trade have become indispensable. Mr. McElrath proposes to supply this want for the department of commerce, with which he became very familiar while occupying the office of Chief Appraiser at the Port of New York, and previously to that, as Corresponding Secretary of the American Institute. The design of the book is to give the technical words and phrases used in mercantile transactions, also statistical information, tariffs, weights, measures, coins, rules of exchange, maxims of law, and descriptions of most articles known in trade. We can recommend it as a valuable work of reference. The following we select as illustrations of the character of the work: "Asbestos, a mineral of the hornblende family, fibrous, flexile, and elastic found in silky filaments which, when mixed with oil, may be woven into a fire-proof cloth, and is used in various manufactures. It is of various colors, white, green, and brown. It is employed in the manufacture of iron safes, and by the natives of Greenland it is used as the wick for lamps. It is found on the eastern side of the Alleghanies and in other parts of the United States, but it is said that nowhere is it so abundant or of so good a quality for weaving as that which is found at Staten Island, within a few miles of the city of New York. The island of Corsica is noted for the excellent quality and abundance of this mineral. It is sometimes called amianthus, and also mountain flax." . . "Bath brick, a polishing brick made of a peculiar kind of clay, a calcareous substance deposited from the river or estuary at and near Bridgewater in England. The water is conveyed into vats or pits at the high spring tides, and is left there until the clay deposits itself at the bottom of the vats, when the water is drawn off at low tide. It is then manufactured into bricks, dried, and burnt; they are of the form, and nearly the size of common building brick, and are largely imported into the United States, and are used mostly for cleaning table-knives."

MYSTERY OF EDWIN DROOD. By Charles Dickens. Price, 25 cents.

MAD MONKTON. By Wilkie Collins. Price, 50 cents.

Messrs. T. B. Peterson & Bros., of Philadelphia, have just issued the above works for general circulation through the mails.

THE PHOTOGRAPHIC WORLD.

This is a new monthly magazine, somewhat similar in character to the Philadelphia *Photographer*, and is issued by the same publishers, Messrs. Benerman & Wilson, Philadelphia, Pa. The *Photographic World* is edited by Edward L. Wilson, an able writer and practical photographer. The new magazine contains a large amount of valuable information relating to the economy and practice of the art to which it is devoted, and will doubtless attain a wide and permanent circulation.

SCRIBNER'S MONTHLY MAGAZINE.

The March number of this new and popular magazine is out, and, as usual is full of original and interesting matter. Some of the best writers in the country contribute to this monthly. J. G. Holland, the popular author, is its editor. Scribner & Co., publishers, 654 Broadway, New York.

WE are in receipt of Nos. 1 and 2, Vol. II., of the *American Journal of Syphilography and Dermatology*. Edited by M. H. Henry, M.D., Surgeon to the New York Dispensatory Department of Venereal and Skin Diseases, and published by F. W. Christern, No. 77 University Place, New York city. It is an ably conducted quarterly journal, devoted to the dissemination of professional knowledge upon two classes of diseases, intimately connected, and unfortunately, far too prevalent. To the profession, this quarterly must possess peculiar interest.

THE SEED CATALOGUE of B. K. Bliss & Sons, for 1871, is a valuable work, of 138 large pages. In addition to full information respecting cultivation, with the names, prices, and descriptions of some two thousand species, it also contains over two hundred excellent engravings of flowers, new varieties of vegetables, etc. Some colored plates are also given. Price 25 cents. See advertisement in another column.

Queries.

[*We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.*]

1.—COATING FOR BOAT BOTTOMS.—What is the best material for coating the bottoms of small pleasure boats, used partly in fresh and partly in salt water? The coating is desired to protect the bottom from fouling, and to preserve the wood.—A. A. R.

2.—CANDLE WICKS.—Is there any preparation which will prevent candle wicks from smoking and smelling badly, when the flame is extinguished?—E. D. F.

3.—IVORY KEYS.—I have attempted to glue the ivory on to a melodeon key, from which the ivory veneer had loosened. The glue shows through, changing the color of the key, and the ivory curls up. How ought I to do this work?—J. H.

4.—GLASS STOPPERS.—How are glass stoppers ground fit the necks of bottles?—L. D.

5.—PULVERIZED SOAP.—Can hard soap be reduced to a fine granular powder? and if so, how?—M. B. C.

6.—FUSEES.—How are the fusees, used for cigar lighting, made, and what is the composition used?—L. B.

7.—KEY MAKING.—What sort of machinery is used, to cut the wards in blank keys, in large establishments?

8.—SOLDERING FLUID.—How can I make a soldering fluid for soft solder that will work well on iron, brass, or copper, and that will no require the removal of grease, or the cleansing of the surfaces to be united—C. W.

9.—SPINNING TIN PLATE.—Can common tin plate (iron and tin alloy) be spun up successfully, like brass? I do not succeed, though I can spin up brass well enough. Can any one help me by advice in this matter?—T. J. K.

10.—GRAFTING WAX.—Will some one give the best recipe for grafting wax for use early and late in the grafting season?—J. H. A.

11.—CEMENT FOR GLASS SYRINGES.—What is a better cement for the pewter cups of glass syringes than plaster of Paris? These cups, cemented in the ordinary way, come loose when the syringes are used, and cause great annoyance. Nearly all the syringes sold for medical use are defective in this respect.—P. E. G.

12.—CANNED OYSTERS.—What is the method of canning oysters? Will some one give me the title and publisher of a good work o food preserving?—J. M.

13.—BLEACHING AND COLORING BROOM CORN.—I wish recipes for the above purposes.—F. B.

14.—PAINT FOR OLD WEATHER-BOARDING.—I wish a recipe for the cheapest and best paint for outside work, so as to save oil, in the first coating on old dry weather-boarding or brick-work.—W. O. D

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Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Half Interest for sale in established Machinery Depot, new and second-hand. Steam fitting connected. Small capital, with energy, required. Address T. V. Carpenter, Advertising Agent, Box 773, New York.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

After an exhaustive trial at American Institute Fair for 1870, Pratt's Astral Oil was pronounced the safest and best.

Safety Kerosene Lamps (Perkins & House's Patent). Explosion or breaking impossible; light equal to gas, and no odor. Families supplied and canvassers appointed, by Montgomery & Co., 42 Barclay st., New York, or Cleveland, O.

Skilled Workers in Wood, Iron, and Stone, please notice advertisement of Warm Spring Colony, Western North Carolina, on page 172.

C. A. Woodbury, West Woodstock, Vt., wants to know who makes Asbestos Cloth.

All parties wanting a water wheel will learn something of interest by addressing P. H. Wait, Sandy Hill, N. Y., for a free circular of his Hudson River Champion Turbine.

Ashcroft's Low Water Detector, $15; thousands in use; 17 year's experience. Can be applied for $1. Send for circular. E. H. Ashcroft, Boston, Mass.

Three Universal Wood Workers, in constant use by Barney & Smith Manufacturing Co., Dayton, O. In their letter of Feb. 17, 1871, to Messrs. McBeth, Bentel & Margedant, they say: "We purchased the first Universal Wood Worker from you in 1868, the second in 1869, and the third in 1870. We find they will do all you claimed for them, entirely satisfactory to us all. We think any one of these Machines we have in use paid for themselves during the first four months. The variety of work they do saves much labor in handling material." Address, for further information, the manufacturers, McBeth, Bentel & Margedant, Hamilton, O.

The best Corn Husker in the world, to let on royalty. One to three millions can be sold annually. See SCIENTIFIC AMERICAN, June 11, 1870. N. Evinger, Sandford, Ind.

Second-hand Corliss Engine, 12x16, wanted. Address, stating condition and price, Geo. W. Rose, Pleasantville, Pa.

Manufacturers and Dealers in Tin Foil, Foil and Fancy Papers, will please send Price List and Samples to D. Miles, Jr., 95 Water st., Boston.

Wanted.—Machines for manufacturing Pails, Tubs, and Matches. Also, competent man to superintend construction of buildings, and manage all parts of business when complete. Address, with descriptive circulars, price, etc., No. 266 Lexington avenue, New York.

Turbine Water Wheels, Portable and Stationary Engines, Gang and Circular Saw Mills, Rolling Mill Machinery, and Machinery for Axe Manufacturers, manufactured by Wm. P. Duncan, Bellefonte, Pa.

For best Power Picket Header in use, apply to Wm. P. Duncan, Bellefonte, Pa.

New Blind Wirer and Rod Cutter. B. C. Davis & Co., Binghamton, N. Y.

Those having smoke-consuming devices, for burning shavings, saw dust, etc., address, with particulars, Geo. Starr, Danbury, Conn.

Self-testing Steam Gage. There's a difference between a chronometer watch and a "bull's eye." Same difference between a self-tester and common steam gage. Send for Circular. E. H. Ashcroft, Boston, Mass.

See advertisement of L. & J. W. Feuchtwanger, Chemists.

H. W. Noyes, Agent for sale of Patent Rights and Patent Goods, North Bridgewater, Mass. Agencies solicited.

$3.50. Stephens' Patent Combination Rule, Level, Square, Plumb, Bevel, etc. See advertisement in another column. Agents wanted.

Wanted.—An experienced and steady man as Foreman of Molders. Apply to Butterworth & Lowe, Engine Builders and Machinists, Grand Rapids, Mich.

Only at 63 Union st., Boston, Crane's Patent and Canvas Signs.

American Boiler Powder Co., Box 315, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for "Scaly Boilers." Orders solicited.

Planing, Sawing, Mortising, Boring, and other Machines, especially arranged for Car Work, from new designs, built by Richards, Kelley & Co., Philadelphia.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Wanted.—An Analytical Chemist. Good references required. Address M. A., Post Office Box No. 3900, New York.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

E. Howard & Co., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers. Office 15 Maiden Lane, N. Y.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

The best place to get Working Models and parts is at T. B. Jeffery's, 160 South Water st., Chicago.

"Edson's Recording Steam Gage and Alarm," 91 Liberty st., N. Y. Recommended by U. S. Inspectors as protection to good engineers, the charts showing quality of work performed.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

First-class Gage Cocks, at E. H. Ashcroft's, 55 Sudbury st., Boston, for $10.80 per dozen.

Thomson Road Steamers save 50 per cent over horses. D. D. Williamson, 32 Broadway, New York.

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Steel name stamps, figures, etc. E. H. Payn, M'f'r, Burlington, Vt.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

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The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., Fair Haven, Conn.

Taft's Portable Hot Air, Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. (Send for Circular.)

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 25 cents per lb. C. D. Fredricks, 587 Broadway, New York.

For Fruit-Can Tools, Presses, Dies for all Metals, apply to Bliss & Williams, successor to May & Bliss, 118, 120, and 122 Plymouth st., Brooklyn, N. Y. Send for catalogue.

McCauley's Improved Force Pump, especially adapted to deep wells. Send for Circular. R. A. McCauley, Baltimore, Md.

2d hand Worthington, Woodward and Novelty Pumps, Engines 25 to 100 H. P., 60 Horse Loc. Boiler. W. D. Andrews & Bro., 414 Water st., N. Y.

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House Planning.—Geo. J. Colby, Waterbury, Vt., offers information of value to all in planning a House. Send him your address.

For small, soft, Gray Iron Castings, Japanned, Tinned, or Bronzed, address Enterprise Manufacturing Company, Philadelphia.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 61 Nassau st., New York.

Conklin's Detachable Rubber Lip, for bowls, etc., works like a charm. For Rights, address O. P. Conklin, Worcester, Mass., or A Daul, Philadelphia, Pa.

To Ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's Manufacturing News of the United States. Terms $4 00 a year.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

All reference to back numbers must be by volume and page.

PASTE.—A correspondent wishes paste that will keep. Let him first prepare in the ordinary way a good flour or starch paste. It can be preserved by adding to it a small quantity of brown sugar, then corrosive sublimate in fine powder in the proportion of about a teaspoonful to the pint of paste; add also a teaspoonful of oil of lavender, or rosemary, or cloves, or any of the essential oils, and a few drops of carbolic acid, and stir well with a wooden spatula. This paste will keep for any length of time "perfectly pure." The *rationale* is this: The corrosive sublimate ensures it against fermentation, and the essential oil and carbolic acid, against mold. Corrosive sublimate in the above is a poisonous agent, but it is not expected, that the paste is to be eaten because of its containing sugar; and in the use of it as paste it is not in the least dangerous, as we all handle with impunity many things more poisonous than this. I do not know in what climate friend "Query 11" resides, but in our Alabama climate—where I now sit in my room, with no fire, windows up, coat off, and thermometer 70° precisely, this 17th February—I find no trouble in preserving paste prepared as above all the year round. If he should find any difficulty in its keeping qualities, he has only to increase a little the preserving ingredients.—B. F. R., of Ala.

ANOTHER.—A correspondent sends the following, found in the Boston *Journal of Chemistry:* Dissolve a teaspoonful of alum in a quart of warm water. When cold, stir in as much flour as will give it the consistency of thick cream, being particular to beat up all the lumps; stir in as much powdered rosin as will lie on a dime, and throw in half a dozen cloves to give a pleasant odor. Pour this flour mixture into a pan containing a teacupful of boiling water, and stir it well over the fire. In a very few minutes it will be of the consistency of mush. Pour it into an earthen or china vessel; let it cool; lay a cover on, and put in a cool place. When needed for use, take out a portion and soften it with warm water. Paste thus made will last twelve months. It is better than gum, as it does not gloss the paper, and can be written on.

CHEAP BATTERY.—Let L. D. take a gallon stone jar, and put in it a sheet of zinc bent to fit it; inside of the zinc put a porous cup, either of porcelain, unglazed earthen or stone ware, or an unglazed flower pot, with the hole in bottom stopped by waxed cork, or wax. Put a saturated solution of sulphate of copper inside the porous cup, and solution of common salt outside in stone jar. Put a piece of sheet lead or copper in the blue vitriol solution, and fasten soft copper wire both to zinc and lead, either by solder, or tied through a hole. Better get "Napier on Electro Metallurgy," or a work imported by Thomas Hall, Boston, before attempting to do much I enclose specimen of electroplate by such battery, which has now run for twenty-three days continuously.—A. G. [The specimen referred to shows the battery to be quite effective.—EDS.

BOOT BLACKING.—W. H. P. will find the following a good recipe: Ivory black, "killed" with a tablespoonful alcohol, ¼ pound; sweet oil, 1 fluid ounce; molasses, ½ pint; hydrochloric acid, 1 ounce; sulphuric acid, 1 ounce; mix the first three ingredients, add the acids, and 3 pints of vinegar if it is to be liquid blacking. No "challenge blacking" equals this.

JOURNAL OF MILL SPINDLE.—We would suggest to H. A. S. the use of a cast-iron step, and to put a little pure plumbago in the oil. The plumbago makes the iron more slippery than Babbitt, while if there be any wear the plumbago is harmless, and the iron beneficial to health.—B. & W.

E. H. C., of Mo., desires us to give an opinion of the cause of a boiler explosion, from a brief description forwarded by him. We respectfully decline to give opinions of this kind, unless we have opportunity for personal examination.

L. A. S., of N. Y.—We recommend you the Polytechnic School, at Stuttgard, as being probably the best in Germany for an American to attend.

Dr. R. M., of Pa.—We know of no work which specially treats of drying lumber by artificial heat. Various articles on this subject have appeared from time to time in the SCIENTIFIC AMERICAN.

J. W., of Pa.—The "Painter, Gilder, and Varnisher's Companion," published by Henry Carey Baird, of Philadelphia, contains the information you seek.

F. L. C., of Ohio.—The application of a rod to dampers to regulate the draft in furnaces, by expansion and contraction, is the same idea you advance for a perpetual motion.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WASH BOILER.—T. U. Parker, Mifflintown, Pa.—This invention relates to an automatic wash boiler, and consists in attaching transverse ribs to the upper side of the false bottom, for supporting the clothes above the water line, and provides the vertical discharge tubes with perforated "rose heads," whereby water is delivered over the whole surface of the clothes.

MOWER AND REAPER.—Daniel Mulock, Mount Hope, N. Y.—This invention relates to a new mower and reaper, which is so constructed that it can be used with suitable speed of the cutters, and without side draft. The invention consists in a novel arrangement of gearing for varying the speed; in a new method of balancing the cutter bar, so that it will not drag on the ground, nor be injured by protuberances; in a new manner of constructing the cutter bar and finger bar for strengthening the same; in a novel manner of arranging stationary end cutters on the finger bar, to prevent clogging at the ends; in a new adjustable wedge, for regulating the degree of inclination of the finger bar; and in a novel construction and arrangement of joints and shafting for the parts, and novel construction of braces.

REVOLVING BATTERY GUN.—R. J. Gatling, Indianapolis, Ind.—The object of this invention is to perfect the mechanism of the original Gatling gun, in such manner that more satisfactory operation, greater strength and durability, and simpler construction will be obtained. The invention consists chiefly in making the "cocking cane" laterally adjustable, so that the same may, while experiments are made with the gun without firing the same, be drawn out to not snap the locks, and that it may also be easily set in to operate the locks when firing is to be carried on. The cocking cane is also made longitudinally adjustable, for the purpose of varying thereby the force of the spring which operates the lock hammer. Some kinds of cartridges are made of thicker metal than others, and require, consequently, stronger blows in order to explode their fulminates. It is therefore very essential that the blow should be regulated in accordance with the material of which the cartridges are made. The invention consists, also, in perforating the cascabel plate and the back diaphragm in the outer casing, and in closing the apertures through both these plates by a removable plug, for the purpose of enabling the removal and reinsertion of either one or more of the locks, without requiring the cascabel plate to be taken off. The repair or inspection of all parts of the gun is thereby considerably facilitated.

ADJUSTABLE ANIMAL POWER.—N. Potter, East Troy, Pa.—This invention has for its object to furnish an improved animal power, which shall be so constructed that the inclination of the track may be increased or lessened, as may be required, without stopping the machine, removing the animal, lengthening or shortening the endless band, or affecting any of the operating parts of the machine.

FENCE.—John Waddle, Bakerstown, Pa.—This invention has for its object to furnish an improved fence, simple and economical in construction and durable in use, and which is designed for use as a stationary or portable fence, as may be desired.

STEAM AND WATER ENGINE.—H. J. King and D. C. Mulock, Middletown, N. Y.—This invention relates to several improvements in the construction of the valve gear and other working mechanism of steam and water engines, and consists in a novel construction of valve, cut-off, piston, cross-head, and valve gear, all arranged with an object of simplifying the construction of the machinery and avoiding friction.

COTTON PLANTER.—R. F. Norwood, Charlotte, N. C.—This invention relates to improvements in feed apparatus for dropping cotton seed fertilizers and the like, and it consists in a grooved revolving cylinder, arranged in the bottom of the hopper, to receive the seed in the grooves, through a pair of vibrating gates above, operated by the attendant, and a spring cutting-off gate, which permits the discharge from more than one of the grooves at once, said spring being pushed back, to open the passage for the seed, by pins projecting from the roller, and the latter being turned by connection with the wheel on which the machine is mounted.

LIFTING JACK.—B. F. Johnson, Glasgow, Mo.—This invention relates to improvements in lifting jacks for lifting wagons and other articles, and it consists in a novel arrangement, with a stand, of a vertically movable lifting block, operating lever, and holding pawl.

COUNTERSINKING AND REAMING ATTACHMENT TO BORING INSTRUMENTS.—F. H. Palmer, Foxcroft, Me.—This invention relates to improvements in attachments for boring instruments, and consists in a countersink and reamer, provided with a kind of clamping attachment which may be clamped on the shank of a boring instrument, and so adjusted that either one may be used as it is required to countersink or ream the hole at the same time that it is bored.

SEWING MACHINE TREADLE.—F. E. Mills, California, Cal.—The nature of this invention consists in so constructing the foot board and other parts of the treadle, relative to its axis, that the ankle joint of the operator may be always placed in line with the center of motion of the treadle, and held there, thereby saving that unnecessary exertion and waste of power occasioned by the motion of the entire lower limb, whenever the ankle is in any other position.

STEAM AND HYDRAULIC PRESS.—John F. Taylor, Charleston, S. C.—This invention relates to a press for cotton or any other material, in which the platen is operated by the introduction beneath it of oil or some other liquid under pressure, communicated to said liquid by the pistons of a steam cylinder, and in which the platen is lowered by its own weight, and the expansion of the material compressed, both acting through the medium of the liquid upon the pistons, which are permitted to yield by the opening of valves in the ends of the cylinders in rear of the pistons, through which steam escapes before the returning pistons; the pistons acting upon the platen alternately, one to impart the initial pressure, and the other the finishing pressure; the piston that imparts the initial pressure being operated by the exhaust steam of the other cylinder, which steam having then done all that is required of it, is discharged into the atmosphere; and the piston that imparts the finishing pressure being operated by live steam from the boiler, which steam is subsequently discharged into the other cylinder there to communicate another initial pressure to the platen.

NAIL MACHINE.—Henry Reese, Baltimore, Md.—This invention consists in an arrangement of quadrant blocks and operating gear, whereby a heated rod introduced into transverse grooves between the blocks is reduced to a headless nail, and cut off by the blocks, which move in opposite directions. The head of the nail is formed by a subsequent operation.

SELF LOADING DUMPING CART.—Ansell P. Boutt and John J. Keeton, Liberty Mills, Va.—This invention consists of a mechanism for holding the body of a dumping cart inclined so as to scrape up earth, and of a mechanism by which certain hoes, located within the cart body, are operated to draw the loosened earth into the same, and of a device for holding the cart body horizontal while in route to or from the place where it is employed in excavating.

FIRE-ESCAPE LADDER.—William B. Peregoy, Baltimore, Md.—This invention relates to a ladder made in curved sections that are jointed together, one end of the ladder being attached to the periphery of a drum stationed inside any one of the upper windows of the building, and provided with means for its revolution, from which drum the ladder may be uncoiled and let down to the ground or pavement.

COMBINED COTTON PLANTER AND GUANO DISTRIBUTOR.—J. H. Nicholes, Sumter, S. C.—This invention has for its object to furnish an improved machine for planting cotton seed and distributing guano, which shall be simple in construction, effective and reliable in operation, and convenient in use.

ODOMETERS.—David L. Branning, Tampa, Fla.—This invention relates to improvements in odometers, and consists in an arrangement of adjustable arms on the axle, to which motion is imparted by the wheel of the vehicle which arms may be set for indicating the distance travelled by the wheels different diameters. It also consists in a combination with the said arms secondary set, pivoted to the frame, and arranged for indicating the fractions of miles.

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WASHING MACHINE.—William C. Bain and John J. Kendall, Troy's Store, N. C.—This invention relates to new and useful improvements in machines or washing clothes.

SAWING MACHINE.—N. H. Bolton, Oniro, Wis.—This invention relates to improvements in sawing machines, whereby it is designed to provide a machine for sawing the "spalts," or waste blocks, from shingle machines, into shingles, in a manner to utilize the whole of the timber, of which a considerable percentage is now wasted, owing to the fact that, in most shingle machines, the stock cannot be wholly worked up, the holding dogs being in he way of the saws.

OPERATING ANNULAR CIRCULAR SAWS.—George W. Lombard, Westminster, Mass.—This invention consists in facing or lining the beveled groove of the driving wheel, and also the grooves of the support or guide, with raw hide or equivalent material, and also in substituting adjustable stationary supports for the ordinary rotating supports.

SWORD SCABBARDS.—Virgil Price, New York city.—This invention has for ts object to so improve iron and steel scabbards that the same will be protected from corrosion, strengthened so as not to be readily indented, and made less expensive than the metallic scabbards heretofore in use. The invention consists in providing an iron or steel scabbard with a plating of nickel.

LAMP CHIMNEY.—James M. Rankin, Jr., Brooklyn, N. Y—This invention has for its object to furnish an improved lamp chimney, which shall be so constructed and formed as to cause a more perfect combustion of the escaping and ignited gases, give a better shape to the flame, and a more perfect dissemination of light than the chimneys constructed in the ordinary manner.

COMBINED CRIMPING AND SAD IRON.—Charles Anderson, Montana, Iowa.—This invention has for its object to furnish an improved sad iron, which shall be simple in construction, conveniently manipulated, and which may be used for crimping or ironing, as may be desired.

STEAM ENGINE.—Powell F. Nickerson, Smyrna, Del.—This invention relates to a new and useful improvement in steam engines, and consists mainly in giving the cylinder a longitudinal movement at each stroke of the piston.

WHEEL FOR VEHICLES.—Daniel Mulock, Mount Hope, N. Y.—This invention relates to a new manner of securing spokes to the hubs of wheels, and to a novel construction of indented tire for the same.

SIGHTS FOR FIREARMS.—Frederic A. Churchill, Pittsfield, Mass.—This invention relates to a new construction of sights for fire-arms of all kinds, both in front and rear.

FAUCET.—W. C. Wise and John Ashman, Chelsea, Mass.—This invention relates to new and useful improvements in faucets for the discharge or stoppage of water, steam, or gas, and it consists mainly in the use of an elastic floating ball valve, which is pressed to its seat by a screw stem or pindle, upon the end of which is an adjustable cone, for bearing on the valve.

GRAIN SEPARATOR AND FANNING MILL.—S. S. Hammond and John S. Paden, North East, Pa.—This invention relates to improvements in the arrangement of mills for separating and fanning grain, and has for its object to provide clear, unobstructed air passages for the artificial draft, and ready access to all parts.

MACHINE FOR CUTTING AND MITERING PRINTERS' RULES.—F. H. Aiken, Franklin, N. H.—This invention relates to improvements in machinery for cutting and mitering printers' rules, and it consists in an arrangement, on one portable base, of a shear and gage for cutting the plates; also an adjustable holder and a reciprocating dressing tool for mitering the rules.

COMBINED HEATING AND COOK STOVE.—Lemuel Dunham, Lincoln Center, Me.—This invention relates to improvements in stoves, and it consists in a cooking attachment to what is known as the Franklin heating stove.

WASHING MACHINE.—Theophilus Beebe, Northport, N. Y.—This invention relates to improvements in machines, and it consists in a fixed rubber of round rods of wood connected to the end pieces, forming about one sixth of a circle, more or less, placed in a case, so as to be readily removed, and a suspended rubber consisting of a grooved board, which is suspended on journals supported on springs and adjusting screws, in posts at one side of the case, in a manner to allow a wide range of movement to the said rubber, for accommodating it to the quantity of clothes in hand.

GRAIN DRYER.—John Buckingham, Wethersfield, Conn.—This invention relates to improvements in grain-drying apparatus, and it consists in a combination of steam heating coils and ventilators, in a bin or other chamber, through which the grain is caused to flow slowly from top to bottom, in a simple and efficient manner, for applying the heat and carrying off the vapor generated thereby.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING FEB. 28, 1871.

Reported Officially for the Scientific American.

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112,104.—TOY PROPELLER.—Arthur M. Allen, New York city Antedated February 11, 1871.
112,105.—SAD AND CRIMPING IRON.—Charles Anderson, Montana, Iowa.
112,106.—PYROMETER.—William Henry Bailey, Albion Works, Salford, Great Britain.
112,107.—WASHING MACHINE.—William C. Bain and John J Kendall, Troy's Store, N.C.
112,108.—WRENCH.—Elias Beach, Titusville, Pa.
112,109.—WRENCH.—Elias Beach, Titusville, Pa.
112,110.—WASHING MACHINE.—Theophilus Beebe, Northport, N.Y.
112,111.—APPARATUS FOR CARBURETING AIR.—Alexander Dalrymple Bell, San Francisco, Cal.
112,112.—CHEESE-TURNING APPARATUS.—John Q. Black, Richland Center, Wis.
112,113.—STRAW CUTTER.—Bengt C. Blomsten, Waupaca, Wis.
112,114.—SAWING MACHINE.—N. H. Bolton, Omro, Wis.
112,115.—DRILL.—Theodore V. Boyden, Bridgeport, Conn.
112,116.—ODOMETER.—David L. Branning, Tampa, Florida.
112,117.—FEED CUTTER.—Henry A. Buck, Fredonia, N. Y.
112,118.—GRAIN DRYER.—John Buckingham, Wethersfield, Conn.
112,119.—SELF-CENTERING CHUCK FOR LATHES.—George O. Buckley, New Bedford, Mass.
112,120.—APPARATUS FOR HEATING LIQUIDS.—David H. Burrell, Little Falls, N.Y.
112,121.—PROJECTILE FOR ORDNANCE.—John G. Butler, United States Army.
112,122.—HOT AIR FURNACE.—Benjamin F. Campbell, Boston, Mass.
112,123.—DOOR KEY.—Charles C. Carpenter, Huntsville, Ala.
112,124.—GUN SIGHT.—Frederic A. Churchill, Pittsfield, Mass.
112,125.—SHUTTLE FOR SEWING MACHINES.—Theodore Colston (assignor to himself and Charles E. Billings), Hartford, Conn.
112,126.—LAP BOARD.—Daniel P. Cook, Hartford, Conn.
112,127.—MAGAZINE FIRE ARM.—Joshua Davis, Limestoneville, Pa.
112,128.—WATER WHEEL CURB.—Walter S. Davis, Warner, N.H.
112,129.—PRESERVING FISH BY FREEZING.—Samuel H. Davis and David W. Davis, Detroit, Mich.
112,130.—MEADOW CULTIVATOR.—Frank Philip Davenport, Carthage, Ill., assignor to himself, John W. Cherry, and Thomas Logan.
112,131.—CORN-HUSKING BENCH.—Joel E. Draper, Northville, assignor to himself and Robert Dunlap, 1st, South Lyons, Mich.
112,132.—COOKING STOVE.—Lemuel Dunham, Lincoln Centre, Me.
112,133.—PORTABLE FEED RACK.—Edwin Farquhar, Aukenytown, Ohio.
112,134.—ATTACHING KNOBS TO THEIR SPINDLES.—William A. Fenn, Rochester, N.Y.
112,135.—TRACTION ENGINE.—George W. Fitts, Oberlin, Ohio.
112,136.—PRESERVING BLOCKS OF WOOD.—Edgar M. Fowler, New York city.
112,137.—LIGHTNING ROD.—Joseph R. Fricke, Pittsburgh, Pa.
112,138.—REVOLVING BATTERY GUN.—Richard Jordan Gatling, Indianapolis, Ind.
112,139.—BEE HIVE.—Joseph H. Gisler, St. Louis, Mo.
112,140.—BALING SHORT-CUT HAY OR STRAW.—William Hadwin, Rochester, N.Y., assignor to himself and Isaac S. Wilson.
112,141.—GRAIN SEPARATOR AND FANNING MILL.—Samuel S. Hammond and John L. Paden, North East, Pa.
112,142.—EXTRACTOR FOR OIL WELLS.—Hart Harris, Tidioute, Pa.
112,143.—SCREW DRIVER.—Henry L. Hildreth, Lockport, N.Y.
112,144.—PROJECTILE FOR ORDNANCE.—B. B. Hotchkiss, New York city.
112,145.—BELT GEARING.—George C. Howard, Philadelphia, Pa.
112,146.—LAWN MOWER.—Amer Ingrham (assignor to William L. Boyer & Brother), Philadelphia, Pa.
112,147.—HARVESTER.—Isaac A. Johnson (assignor to himself and Frederick H. Manny), Rockford, Ill.
112,148.—SHIPS' WINDLASS.—Christopher Coatsworth Jordeson, Montreal, Canada.
112,149.—HARROW AND FIELD ROLLER.—Abraham S. Keagy, Harristown, Ill.
112,150.—ANIMAL POKE.—Lewis Kelley (assignor to himself and Joel Andrews), Saranac, Mich.
112,151.—STEAM AND WATER ENGINE.—Henry James King and Daniel Charles Mulock, Middletown, N.Y.
112,152.—STUBBLE ATTACHMENT FOR PLOWS.—Jesse Kinney, London, assignor to himself and Cyrus Kinney, Ingersoll, Canada.
112,153.—SEPARATING METAL FROM ORES.—Solomon W. Kirk, Philadelphia, Pa.
112,154.—COMPOSITION FOR POLISHING.—Carl J. H. F. Kleemann (assignor of one half his right to Arnold C. Franck), New York city.
112,155.—MACHINE FOR PATCHING, PUNCHING, AND EMBOSSING BUTTON HOLES OF PAPER COLLARS.—Charles Lang, Jersey City, N. J., assignor of one half his right to Henry G. Clagstone, New York city.
112,156.—SAWING MACHINE.—George W. Lombard, Westminster, Mass.
112,157.—PUMP.—David Loomis, Joy Winters, and Albert Stark, Clyde, Ohio.
112,158.—SPRING BED BOTTOM.—Joseph E. Lord, Quincy, Ill.
112,159.—GOVERNOR FOR STEAM ENGINES.—John Augustus Lynch, Boston, Mass.
112,160.—URN FOR STOVES.—Orville F. Mack, Charlestown, Mass.
112,161.—CORN AND COTTON SCRAPER, ETC.—Cyrus Marsh, 2d, Natchez, Miss.
112,162.—TREADLE FOR SEWING MACHINES.—F. E. Mills, San Francisco, Cal.
112,163.—EXPLOSIVE COMPOUND.—William Mills, New York city.
112,164.—PORTABLE FURNACE.—D. B. Montague, Springfield, Mass.
112,165.—PORTABLE BOOK HOLDER.—Chas. C. Moore, New York city.
112,166.—HARVESTER.—Daniel Mulock, Mount Hope, N. Y.
112,167.—WHEEL FOR VEHICLES.—Daniel Mulock Mount Hope, N. Y.
112,168.—STAIR AND FLOOR PLATE.—Peter W. Neefus, New York city.
112,169.—COMBINED COTTON PLANTER AND GUANO DISTRIBUTER.—John H. Nicholes, Sumter, S. C.
112,170.—STEAM ENGINE.—Powell F. Nickerson, Smyrna, Del.
112,171.—COTTON PLANTER.—Rufus F. Norwood, Charlotte, N. C.
112,172.—CHANDELIER GAS BURNER.—Rufus Nutting, Randolph, Vt.
112,173.—FAUCET.—Cornelius B. O'Sullivan, New Orleans, La.
112,174.—GATE.—C. N. Owen, Salem, Ohio.
112,175.—MATTRESS.—W. H. Pack and J. S. Vanhorn, Jersey City, N. J.
112,176.—COUNTERSINK.—F. H. Palmer, Foxcroft, Me.
112,177.—PUMP.—John S. Patric (assignor to Hiram Lawton) Rochester, N. Y.
112,178.—STOVE-PIPE THIMBLE.—Jas. D. Pierce (assignor to himself and John B. Smith), Milwaukee, Wis.
112,179.—ADJUSTABLE ANIMAL POWER.—Nicholas Potter, East Troy, Pa.
112,180.—BALDRIC.—Virgil Price, New York city.
112,181.—METHOD OF COATING AND FINISHING SWORD SCABBARDS.—Virgil Price, New York city.
112,182.—LAMP CHIMNEY.—J. M. Rankin, Jr., Brooklyn, N.Y. Antedated February 24, 1871.
112,183.—VALVE FOR CONDENSERS.—George H. Reynolds (assignor to himself and Cornelius H. Delamater, and A. K. Rider), New York city.
112,184.—SEWING MACHINE TREADLE.—Leo W. Sapp, Cleveland, Ohio.
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112,197.—MACHINE FOR FELTING HAT BODIES.—Joseph Vero, Dewsbury, near Leeds, England.
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112,199.—FIREPLACE.—J. W. Wetmore, Erie, Pa.
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112,216.—STOP VALVE.—Sidney Broadbent and W. B. Culver, Scranton, Pa.
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112,222.—STEAM SAFETY VALVE.—G. H Clemens, Chicago, Ill.
112,223.—BINDER FOR SEWING MACHINES.—J. L. Coles (assignor to himself and J. W. Corey), Newark, N. J,
112,224.—BALING PRESS.—T. J. Corning, San José, Cal.
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112,236.—MODE OF FASTENING HARROW TEETH.—George Fry, Nowaygo, Mich.
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112,239.—WOODEN PAVEMENT.—Jackson Grant, Milwaukee, Wis.
112,240.—SPOON.—Florian Grosjean, Brooklyn, N. Y.
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112,245.—GUIDE FOR SEWING MACHINES.—Franz Herterich, Jersey City, N. J.
112,246.—GRATE FOR BURNING COAL SCREENINGS.—G. W. Hildreth, Lockport, N. Y.
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112,251.—HORSE POWER.—J. W. Huntoon, St. Louis, Mo.
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112,253.—MACHINE FOR WARPING YARN.—Daniel Hussey Lowell, Mass.
112,254.—ROCK DRILL.—Simon Ingersoll, Brooklyn, N. Y.
112,255.—METHOD OF FORMING SPUR-LIP OF AUGER BITS.—W. A. Ives, New Haven, Conn.
112,256.—LOW WATER INDICATOR.—Hiram Kimball, Randolph, Vt. Antedated Feb. 23, 1871.
112,257.—HEAD BLOCK FOR SAW MILLS.—W. A. L. Kirk Hamilton, Ohio.
112,258.—CHEST PROTECTOR.—Peter Lear, Boston, Mass.
112,259.—SOAP COMPOUND.—Henry Loos, Lawrence, Kansas
112,260.—STOVE-PIPE DAMPER.—W. H. Lutz (assignor to himself and William Boas), Lancaster, Pa.
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112,277.—SHOW CASE FOR SPOOL THREADS.—A. C. Phillips, Chicago, Ill.
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112,279.—SPOKE AND FELLY MACHINE.—David Reed and T. E. Pierce, Sullivan, Ind.
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112,286.—MODE OF MOLDING AND CASTING PIPE ELBOWS.—George Ross, Newport, Ky.
112,287.—SELF-LOADING SCRAPER.—Ansell P. Routt and John R. Keeton Liberty Mills, Va.

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112,292.—NUMBERING AND PAGING MACHINE.—Alpheus C. Sine, Cincinnati, Ohio.
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112,294.—COOLING, FREEZING, AND PRESERVING SOLIDS, LIQUIDS, AND GASES.—Daniel E. Somes, Washington, D. C.
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112,296.—SAW JOINTER FOR CIRCULAR SAWS.—John H. Stevenson, Birmingham, Ohio.
112,297.—WASHING MACHINE.—John Taylor, Philadelphia, Pa.
112,298.—STEAM AND HYDRAULIC PRESS.—John F. Taylor, Charleston, S. C.
112,299.—GRAIN DRILL.—John H. Thomas (assignor to himself and Phineas P. Mast), Sprin field, Ohio.
112,300.—HEDGE TRIMMER.—James M. Vannosdall and Oliver Vannosdall, Newark, Ill. Antedated February 18, 1871.
112,301.—CONSTRUCTION OF WOODEN BOXES.—William F. Veber (assignor to S. P. Tolman and C. C. Roberts), Perrysburg, Ohio.
111,302.—PLOW.—Harvy Washburn, Pultney, N. Y.
112,303.—CLOTHES PIN.—Hiram J. Wattles, Rockford, Ill. Antedated February 25, 1871.
112,304.—FRUIT PRESS.—G. J. Wells, South Vineland, N. J., assignor to John W. Snyder.
112,305.—CARTRIDGE.—Rollin White, Lowell, Mass.
112,306.—PAPER BOX.—John Warren Wilcox, New York city,
112,307.—UMBRELLA.—James Willis, Stockbridge Works. near Sheffield, England.
112,308.—SEWING MACHINE.—Wm. C. Winters, Rochester, N. Y.

REISSUES.

4,277.—HAT.—John P. Beatty, Norwalk, Conn.—Patent No. 88,116, dated March 23, 1869; antedated February 2, 1869; reissue No 3,855, dated March 1, 1870.
4,278.—GLOVE.—Remus D. Burr, Kingsborough, N. Y.—Patent No. 80,707, dated August 4, 1868.
4,279.—STEAM ENGINE.—Philip Estes, Leavenworth, Kansas. Patent No. 108,576, dated October 25, 1870.
4,280.—FOLDING CHAIR.—F. M. Holmes, Boston, Mass.—Patent No. 111,455, dated January 31, 1871.
4,281.—HARVESTER.—Henry F. Mann, Pittsburgh, Pa., for himself and as assignee of Jacob J. Mann.—Patent No. 15,014, dated June 3, 1856; extended seven years.
4,282.—BREAST PUMP.—Morris Mattson, New York city.—Patent No. 85,318, dated December 29, 1868.
4,283.—LOCK NUT.—John Miller, Jr., Marshalltown, Iowa.—Patent No. 106,927, dated November 1, 1870.
4,284.—LAMP.—Albert H. North, Hartford, Conn., assignor to Rufus S. Merrill; said Merrill assigns two thirds of his right to Wm. B. Merrill and Joshua Merrill, Boston, Mass.—Patent No. 23,483, dated April 5, 1858.
4,285.—SPRING FOR BEDS, ETC.—Charles Rich (assignor to the Metallic Union Spring Company), Poughkeepsie, N. Y.—Patent No. 106,980, dated August 30, 1870.
4,286.—MODE OF SECURING SPRINGS IN UPHOLSTERY.—Wendell Wright, New York city.—Patent No. 16,254, dated December 16, 1856: extended seven years.

DESIGNS.

4,676.—SCREEN.—William N. Bartholomew, Newton Centre, Mass.
4,677.—DRAWER-PULL.—Pietro Cinquini, West Meriden, assignor to Parker & Whipple Company.
4,678.—DRAWER PULL.—Partrick J. Clark, West Meriden, Conn.
4,679 to 4,683.—CARPET PATTERN.—Jonathan Crabtree (assignor to Leedom, Shaw, & Stewart), Philadelphia, Pa. Five Patents.
4,684 and 4,685.—CARPET PATTERN.—Jo athan Crabtree (assignor to Horner Brothers), Philadelphia, Pa. Two Patents.
4,686.—STOCKING FABRIC.—Thomas Dolan, Philadelphia, Pa.
4,687.—WINDOW-SASH HOLDER.—Cassius M. Drury, Granby, N. Y.
4,688.—BED QUILT.—Frederick W. Eger and Henry H. Kunze, Philadelphia, Pa.
4,689.—SUGAR BOWL, ETC.—John H. Hobbs, Wheeling, W. Va.
4,690.—SCHOOL SEAT.—William H. Joeckel, New York city.
4,691.—OILCLOTH PATTERN.—Henry Kagy, Philadelphia, Pa., assignor to Thomas Potter, Son, & Co.
4,692.—WINDOW FASTENER.—William Nelson, Anderson, Ind.
4,693.—REFLECTOR.—August Wilhelm, Philadelphia, Pa.

TRADE MARKS.

175.—GLUE.—Baeder, Adamson, & Co., Philadelphia, Pa.
176.—BEER.—Benjamin Bates, Baltimore, Md.
177.—CHICCORY.—Blume & Co., New York city.
178.—LOCKS AND HARDWARE.—Hillebrand & Wolf, Philadelphia, Pa.
179.—SHIRT.—Lewis Levi, New York city.
180.—WHISKY.—Vidvard & Sheehan, Utica, N. Y.
181.—SEWING MACHINE.—Wheeler & Wilson Manufacturing Company, Bridgeport, Conn.

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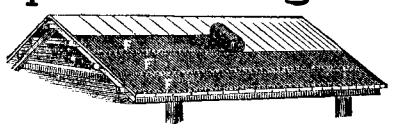

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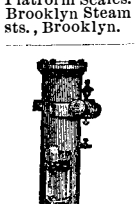

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TO THE EDITORS OF THE SCIENTIFIC AMERICAN:

You are advocating reforms and improvements, and encouraging inventors, in your valuable paper. As a citizen of New Jersey, one who exercises the elective franchise, and as a citizen of the United States (and here let me say, I make no pretension to learning, having never studied grammar; there was not a grammar in the school where I went to school), but as a man of some observation, I wish to say to the citizens of New Jersey, and the citizens of the United States, I am not satisfied with the laws of New Jersey regulating Inns and Taverns. These laws provide for the selling of alcoholic drinks, at excessively high prices, apparently for the purpose of sustaining the house. Does not our State treat her subjects as though these alcoholic drinks were the very articles her subjects need, and that they should use them freely, and that the more they used, the more useful, great, good, and happy they would become?

Now, if our law makers really think this is so, why not carry it out in every way? They might frame the laws so that we might pay our railroad fares, tolls on turnpikes, bridges, ferries, etc., by buying alcoholic drinks. What an immense quantity of alcoholic drinks might be sold on the Fulton ferry boats! And if it be so beneficial to men and boys, that the laws are framed so as to encourage them to drink, to sustain public houses, then it must be beneficial to ladies also; and if the laws were so as to require all the fares on railroads, boats, tolls over bridges, turnpikes, etc., to be paid by all passengers, men and women, by buying alcoholic drinks, at excessively high prices, how soon would many of our young ladies' faces become red, their noses large and red, their eyes inflamed? They would soon become full matches for the young men who travel over the railroads, with red faces, large red noses, and inflamed eyes, discharging foul breath, and often profane language. Enough of this; it is too abominable. And yet it is not more abominable than this old License Law. Why not have a general License Law, to regulate public houses, and make them so we need not fear competition; so that any one who wishes, and will comply with the law, may keep a public house without requiring their neighbors to sign a petition for the privilege. We need public houses as much as we need bridges; and when when we use a bridge we do not take it with us, or any part of it; we simply pass over it, pay for the use of it, and pass on. Why can we not pay for the public house, use it, and pass on, without buying an article we do not need, which does us more harm than good if we use it? Let us make the public house what it ought to be, a comfortable house of entertainment for ladies and gentlemen, on a journey, or a stopping place for those away from home, in health. If any want alcohol, drugs, or medicine of any kind, or even tobacco, let them get them of dealers in such articles. But let us not have a liquor store, a drug store, or tobacco store, or all combined, in one store of the public house. But let us have a house of entertainment, just such a house as a temperate, healthful person needs, containing a well-supplied table and good furnished rooms. Public houses kept on what I have heard called the European plan come the nearest to what I think a public house ought to be of anything I have yet seen, but they have their drinking bar, the great destroyer.

The evils of intemperance are increasingly alarming. What miseries our country is suffering from the use of alcoholic drinks, at this time, no tongue can tell, no pen can describe. This evil is affecting all classes. Many of our best mechanics are ruined by it; many of our best physicians are ruined by it. Who want to put their lives in a drunken physician's hands? And yet we find we are in such a position before we are aware of it. These physicians drive over the country, call at the public houses for various causes, and they buy a drink to sustain the house; they soon learn to like the drink so well that they will call at the public house on purpose to get the drink. And how soon do they become so useless as physicians that even their drinking companions do not want their services. It is just so with many of our officers, such as constables and sheriffs. They have much business at public houses, and often drink at first to sustain the house; and, like the physician, soon learn to like the drink so well they will not pass by. And how often does a candidate for some office treat his fellowman to get his vote? These things ought not so to be. I think there is an opening here for inventors. The person who can invent a plan which public houses can be kept up without the sale or use of alcoholic drinks, or tobacco, or any other unnecessary article, will be a great public benefactor. And to encourage inventors to think on this subject, I will offer a premium; and as I am a citizen of New Jersey, we will take New Jersey for our territory. I will offer to any man or woman (no difference whether they are American citizens or citizens of some other nationality), if such will bring forth a plan which shall be put in practice, and sustained by laws enacted by the proper authorities of New Jersey, which will prohibit alcoholic drinks, tobacco, or any other unnecessary article, from being sold, kept, used, or given—in short, no such articles as alcoholic drinks, tobacco, etc, to be kept about the premises of such public houses; and these houses are to take the place of the liquor-drinking houses, so that there shall be none kept in New Jersey; and these houses shall be sustained and kept up for two full years, and no public houses wherein alcoholic drinks are kept shall be allowed or sustained. In short, they must all have been driven out of New Jersey two full years, before such person shall be entitled to the premium. I will limit the time to January 1, 1882. If not accomplished by that time, then my offer ceases, and I will be released from the obligation to pay the premium. But if such changes be made, and sustained as aforesaid, for full two years, in the State of New Jersey, previous to January 1 1882, then I obligate myself to pay five hundred dollars to the person who has invented such plan, and brought it into practice in the State of New Jersey. And for the purpose of making the premium sure and secure, I will place securities in a good and uninterested man's hands, who shall be approved by Mr. Munn, of the firm of Munn & Co., of New York city, and those two men may be the judges of who shall be entitled to the premium, and if they cannot agree they may choose another man, and those three men shall decide, according to the provisions of this article, if any person be entitled to the premium, and, if any, who it is. A FRIEND OF HUMANITY.

New Jersey, February, 1871.

N. B.—All editors who may publish this in their papers will please accept the thanks of the author of the above. He desires that every inhabitant of the earth may know that he is opposed to the present custom of keeping public houses, and hopes, by this publication, to free his own skirts from its guilt.

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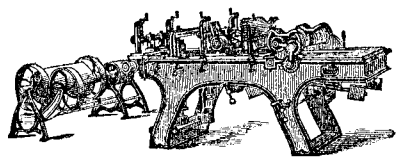

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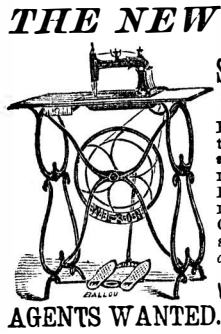

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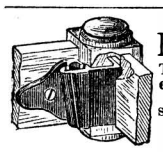

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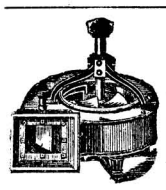

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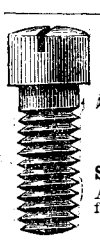

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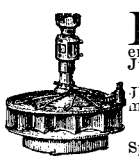

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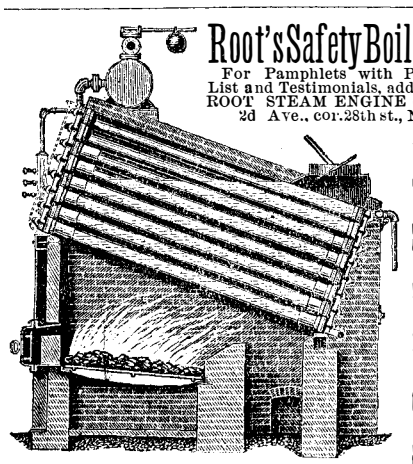

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